Wolfgang Eckstein

Sputtering, Reflection and Range Values for Plasma Edge Codes

MAX-PLANCK-INSTITUT FÜR PLASMAPHYSIK
GARCHING BEI MÜNCHEN

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Abstract:

The Monte Carlo program TRIM.SP (version trvmcmom) was applied to calculate sputtering yields, reflection coefficients and mean ranges for the use in plasma edge codes as EIRENE. Tables of these values are produced in the energy range from 10 eV to 1 keV (for He up to 50 keV) and for 9 angles of incidence. Be, C, and W are chosen as target materials; H, D, T, ^{4}He, N, Ne, and Ar are selected as projectiles. Selfbombardment is regarded, too.

0.1   Introduction

In plasma edge codes it is preferred to get input values from tables. Table lookup and interpolation is usually faster than using a formula. This was the cause to create data tables. Experimental data exist [1] but not in a systematic way. Therefore, the tables were produced by calculations with the Monte carlo program TRIM.SP, which has been shown to give values in good agreement with experimental data in most cases.

0.2   The model

The program TRVMCMOM, a vectorized version of TRIM.SP [2, 3] for multi-component systems with a randomized target structure is based on the binary collision approximation. The KrC potential [4] is applied as interaction potential to describe the elastic collisions between atoms. For the inelastic energy loss an ecpiipartition of the Lindhard-Scharff [5] and the Oen-Robinson [6] models is chosen. Further details can be found in [3]. As surface binding energy the heat of sublimation is used (see table 6.1 in [3]). For the hydrogen isotopes and nitrogen a binding energy of 1 eV is chosen for these projectiles which leads to an acceleration of the incoming species and to a small change in the angle of incidence; it has further an influence on the backscattered species (deceleration and change in exit angle) in the same way as the surface binding energy effects the sputtered atoms.

0.3   Data Representation

The calculated values are given in tables. The tables are arranged in such a way that lines give an angular dependence of sputtering yields at a fixed energy E_o, and columns give an energy dependence at a fixed angle of incidence, a. On top of the tables the values for the atomic numbers, z, and the masses, m, of the projectile (index 1) and the target atoms (index 2) and the value for the surface binding energy (E_s) and the target density (p) are given. Furthermore, the number of incident energies (horizontal lines), ne, and the number of angles of incidence (columns), na, are provided, na is fixed to 9. The angles of incidence are 0 (normal incidence), 15, 30, 45, 55, 65, 75, 80, 85 degrees. The lowest energies are 10 eV in most cases, but in some examples they are as low as 5 eV. 4 he highest energies chosen are 1 keV, but in the case of He bombardment values for energies up to 50 keV are given. The number of energies are chosen in such a way that in each column the sputtering yields do not change by more than about a factor of three between consecutive lines. The sputtering yields are given down to 10^{-5}. A zero value means that the actual value is smaller than $5 \blacksquare 10^{-6}$.

For each projectile - target combination five tables are produced: sputtering yields, sputtered energies, particle reflection coefficients, energy reflection coefficients, and average depths of implanted atoms. The definitions are: the sputter yield, V, is the number of sputtered atoms per projectile, the sputtered energy, *Ye,* is the mean energy taken away by sputtered atoms per projectile energy, the particle reflection coefficient, *Ry,* is the fraction of backscattered projectiles

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(not implanted or transmitted), and the energy reflection coefficient, Re- is the fraction of the incident energy carried by the reflected projectiles.

Besides the tables itself corresponding figures of the values provided in the tables are also shown on the same page, shown. The data are stored at /afs/ipp/u/wge/trim.data/sputter.data, refl.data, and range.data. The tables can be also retrieved by anonymous ftp from /pub/ipp/eckstein.

0.4   Data Use

The calculated values are valid for nearly flat surfaces. To check the sensitivity of simulation results on surface roughness a sputter yield of twice the yield at normal incidence and independent on the angle of incidence can be tried (an assumption used in DIVIMP [7, 8] for rough surfaces).

The energy distribution of the sputtered atoms can be described by a Thompson distribution:

$$f(E)dE = \frac{E}{(L-4)^3}dE \tag{0.1}$$

Applying this distribution an energy E can be determined by a pseudorandom number r clue to the formula

$$\frac{E}{E_s} = \frac{1}{(1 + 1/a)\sqrt{1/r} - 1} \tag{0.2}$$

where E_s is the surface binding energy and a the maximum transferable energy divided by the surface binding energy

$$a = \frac{4m_1m_2}{(m_1 + m_2)} \frac{E_o}{E_s} \tag{0.3}$$

Eo is the incident energy. Another possibility is to use the mean energy $< E >$ of sputtered atoms given by

$$< E(E_0, a)^x >= Eo\frac{Y_E(E_0, a)}{4(Ro-a)} \tag{0.4}$$

The angular distribution of sputtered atoms can be approximated by a cosine distribution. An exit angle 0 can again be determined by a random number r

$$0 = \arcsin r \tag{0-5}$$

For backscattered atoms the situation is more difficult, because there does not exist simple formulae for the energy and angular distributions. As for sputtered atoms one possibility is to use the mean energy of reflected atoms

$$< E(Eo-a) >= Eo\frac{R_E(E_0, a)}{R_N(E_0, a)} \tag{0.6}$$

For rough surfaces the angular dependence of the reflection coefficients is less pronounced as given in the tables.

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Sputter yield of Be by H
zl= 1 , ml= 1.01 , z2= 4 , m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
15	.00002	.00003	.00003	.00002	.00001	.00000	.00000	.00000	.00000
17	.00018	.00020	.00021	.00017	.00010	.00004	.00001	.00000	.00000
20	.00080	.00085	.00092	.00084	.00061	.00031	.00008	.00003	.00001
22	.00145	.00150	.00168	.00165	.00132	.00074	.00023	.00010	.00004
25	.00257	.00275	.00317	.00336	.00289	.00192	.00073	.00033	.00014
30	.00468	.00498	.00582	.00688	.00692	.00553	.00268	.00126	.00048
40	.00846	.00919	.01134	.01480	.01757	.01828	.01100	.00497	.00139
50	.01154	.01243	.01548	.02196	.02885	.03402	.02381	.01054	.00246
70	.01544	.01693	.02186	.03349	.04762	.06400	.05405	.02574	.00428
100	.01847	.02038	.02697	.04381	.06494	.09480	.09733	.05148	.00663
140	.01979	.02242	.03071	.05052	.07706	.11780	.13910	.08569	.01018
200	.02015	.02284	.03270	.05571	.08428	.13310	.17780	.13320	.01697
300	.01926	.02227	.03274	.05644	.08661	.13700	.20730	.19090	.03408
500	.01692	.01983	.02991	.05134	.08016	.13040	.21530	.24330	.08088
1000	.01260	.01494	.02261	.03999	.06282	.10440	.18750	.25100	.19290
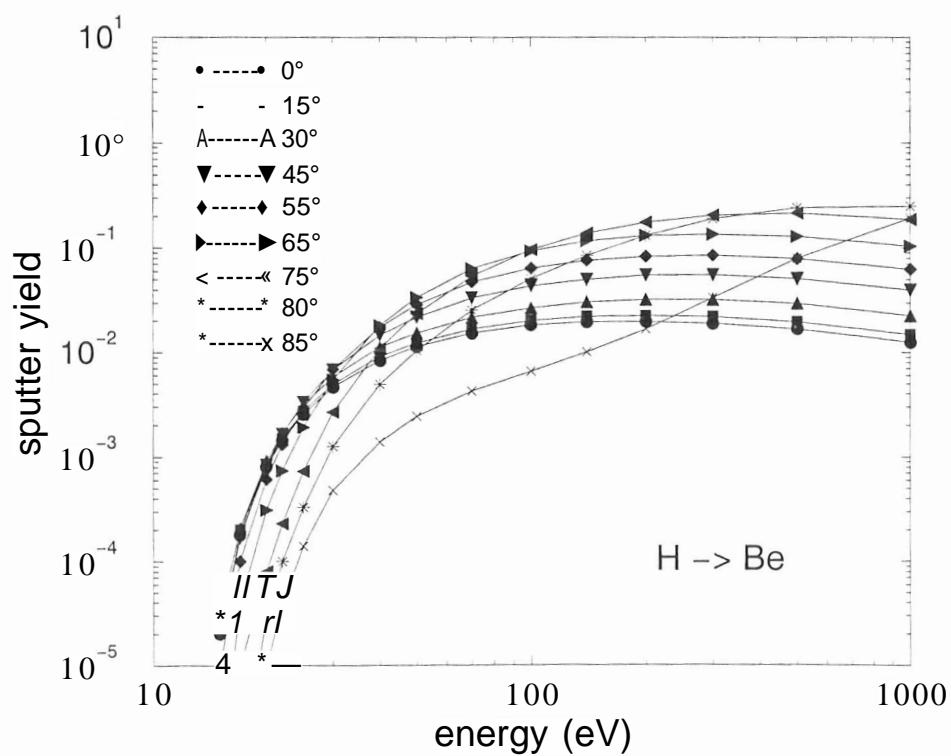
Sputtered energy of Be by H
$z1=$ 1 , m1= 1.01 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
17	.00001	.00001	.00001	.00001	.00000	.00000	.00000	.00000	.00000
20	.00003	.00003	.00004	.00000	.00000	.00000	.00000	.00000	.00000
22	.00006	.00007	.00008	.00000	.00000	.00000	.00000	.00001	.00000
25	.00012	.00014	.00017	.00011	.00011	.00011	.00000	.00002	.00001
30	.00024	.00027	.00033	.00044	.00044	.00033	.00011	.00009	.00004
40	.00046	.00051	.00066	.00099	.00111	.00133	.00088	.00044	.00013
50	.00062	.00067	.00089	.00133	.00188	.00244	.00200	.00098	.00025
70	.00077	.00086	.00114	.00188	.00288	.00433	.00444	.00238	.00043
100	.00082	.00092	.00124	.00211	.00333	.00566	.00700	.00430	.00065
140	.00078	.00088	.00121	.00211	.00344	.00600	.00866	.00613	.00089
200	.00066	.00075	.00108	.00199	.00322	.00577	.00899	.00780	.00127
300	.00050	.00058	.00086	.00166	.00277	.00477	.00811	.00864	.00200
500	.00031	.00038	.00059	.00111	.00199	.00333	.00622	.00774	.00329
1000	.00014	.00017	.00029	.00055	.00100	.00188	.00366	.00511	.00457
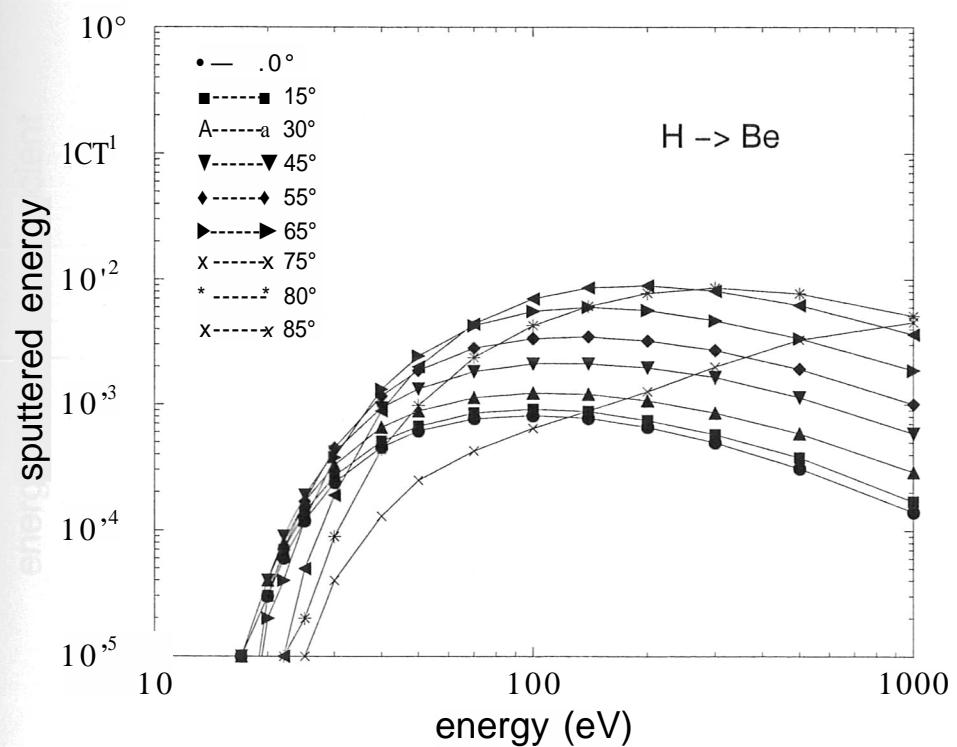
Particle reflection coefficient of H by Be
z1= 1 , m1= 1.01 , z2= 4 , m'2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=16, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.42730	.45061	.52054	.64266	.74832	.85580	.93832	.96139	.97350
15	.37935	.40066	.46460	.58701	.70206	.83154	.93842	.96893	.98329
17	.36593	.38625	.44847	.56804	.68467	.82043	.93718	.96994	.98497
20	.34917	.36815	.42778	.54362	.66064	.80355	.93365	.97078	.98711
22	.33981	.35851	.41613	.52924	.64600	.79237	.93080	.97100	.98821
25	.32774	.34556	.40160	.51048	.62556	.77609	.92597	.97076	.98948
30	.31147	.32827	.38125	.48500	.59654	.75046	.91686	.96978	.99099
40	.28721	.30299	.35287	.44810	.55189	.70476	.89709	.96555	.99261
50	.26935	.28479	.33183	.42234	.51999	.66822	.87496	.96004	.99336
70	.24449	.25784	.30330	.38766	.47594	.61260	.83301	.94555	.99387
100	.21773	.23153	.27391	.35316	.43565	.55965	.77710	.92004	.99325
140	.19400	.20754	.24670	.32335	.40201	.51692	.71746	.88233	.99156
200	.16814	.18097	.21860	.29216	.36925	.47723	.65804	.82833	.98686
300	.13947	.15055	.18669	.25847	.33096	.43504	.59992	.77653	.97449
500	.10286	.11353	.14647	.21266	.28457	.38631	.53907	.67123	.93694
1000	.05909	.06638	.09280	.14997	.21745	.31768	.46734	.58000	.82753
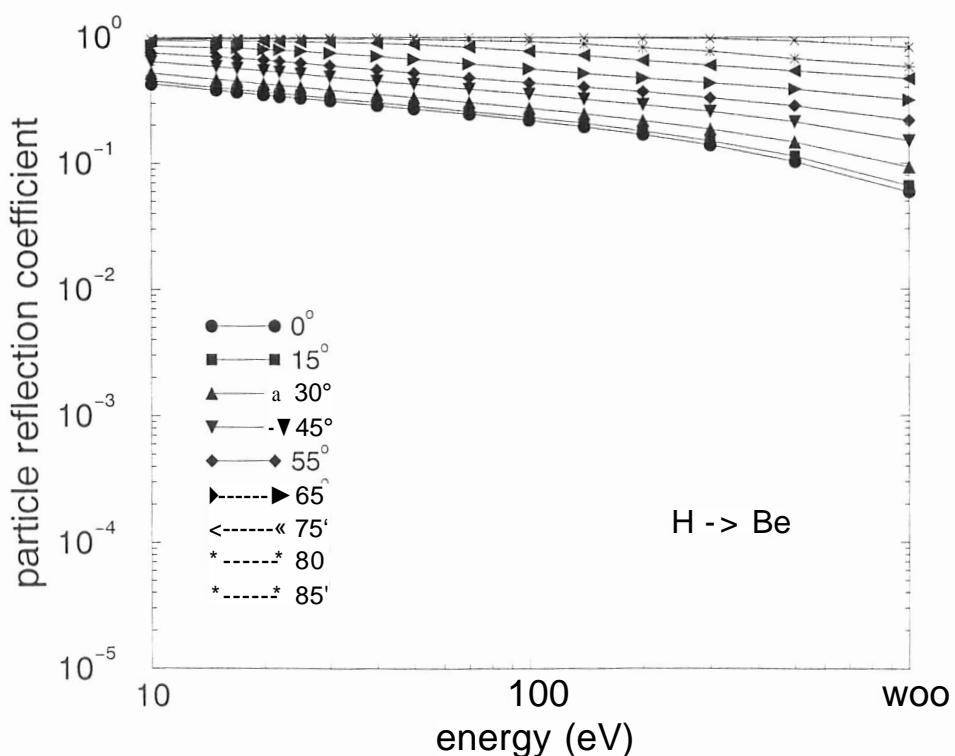
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Energy reflection coefficient of H by Be

z1= 1 , m1= 1.01 , z2= 4 , m'2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=16, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.19598	.21463	.27283	.38815	.50133	.63371	.75754	.79921	.82360
15	.17083	.18672	.23812	.34958	.47061	.62706	.78504	.83977	.87023
17	.16347	.17836	.22746	.33506	.45643	.61913	.78944	.84903	.88102
20	.15420	.16774	.21367	.31580	.43577	.60498	.79183	.85856	.89345
22	.14904	.16225	.20600	.30448	.42269	.59484	.79159	.86314	.89988
25	.14233	.15463	.19626	.28959	.40443	.57924	.78940	.86797	.90758
30	.13337	.14477	.18312	.26921	.37794	.55361	.78240	.87268	.91698
40	.12015	.13048	.16472	.23999	.33730	.50625	.76227	.87405	.92839
50	.11076	.12027	.15167	.22044	.30810	.46784	.73704	.87028	.93487
70	.09786	.10572	.13410	.19462	.26979	.40980	.68601	.85427	.94167
100	.08458	.09219	.11717	.17063	.23611	.35552	.61751	.82106	.94528
140	.07290	.07998	.10220	.15057	.20904	.31275	.54502	.77062	.94547
200	.06082	.06716	.08703	.13054	.18403	.27508	.47325	.69801	.94015
300	.04809	.05303	.07034	.10926	.15652	.23739	.40932	.60281	.92186
500	.03293	.03717	.05108	.08297	.12376	.19409	.33350	.48951	.86471
1000	.01683	.01920	.02832	.05062	.08154	.13852	.25485	.37092	.70202
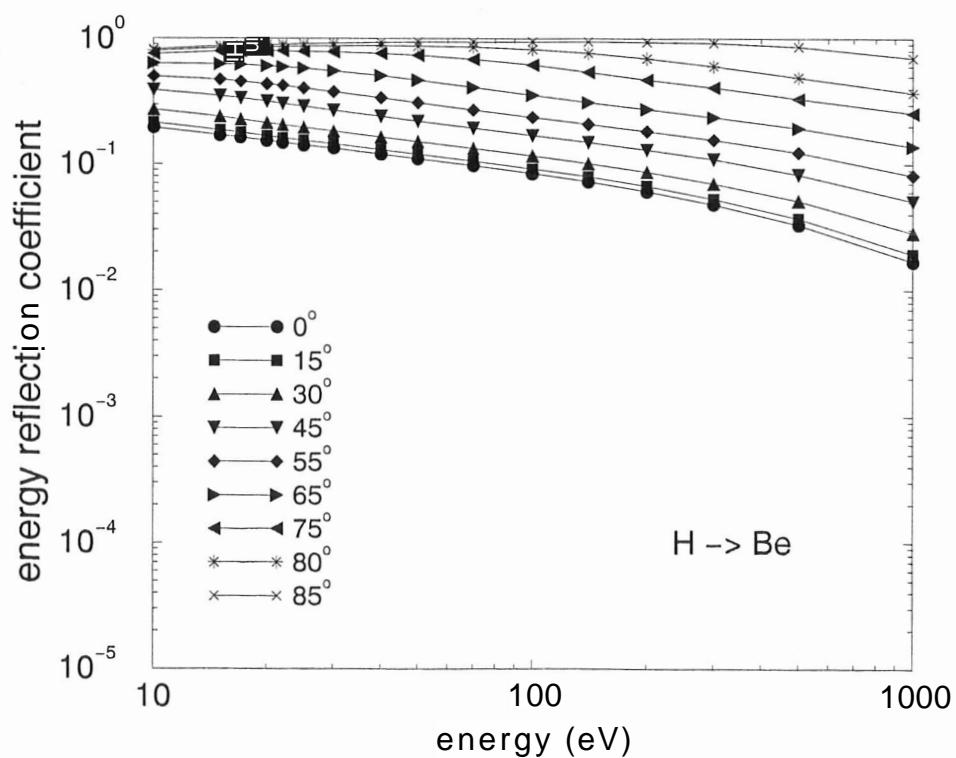
Average depth of implanted H in Be
z1= 1 , m1= 1.01 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=16, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	5.1	5.1	5.0	4.8	4.7	4.5	4.3	4.2	4.2
15	6.9	6.8	6.6	6.4	6.2	6.0	5.7	5.6	5.6
17	7.5	7.5	7.3	7.0	6.8	6.5	6.3	6.2	6.1
20	8.5	8.4	8.2	7.9	7.6	7.3	7.1	6.9	6.8
22	9.2	9.1	8.8	8.4	8.2	7.9	7.6	7.4	7.3
25	10.1	10.0	9.7	9.3	8.9	8.6	8.3	8.1	8.0
30	11.6	11.5	11.1	10.6	10.2	9.9	9.5	9.3	9.1
40	14.5	14.4	13.9	13.2	12.7	12.2	11.8	11.6	11.3
50	17.4	17.1	16.5	15.7	15.1	14.5	13.9	13.7	13.4
70	22.8	22.5	21.7	20.5	19.5	18.7	18.0	17.7	17.4
100	30.7	30.3	29.1	27.3	26.0	24.8	23.8	23.4	23.1
140	40.9	40.3	38.5	36.0	34.2	32.4	31.0	30.5	30.0
200	55.8	54.8	52.3	48.6	45.8	43.3	41.1	40.5	40.6
300	80.0	78.4	74.4	68.6	64.1	60.3	56.7	55.7	55.4
500	126.4	123.8	116.5	105.9	98.2	91.0	85.0	82.8	82.5
1000	237.0	231.2	214.5	190.8	173.5	156.6	143.1	138.1	135.7
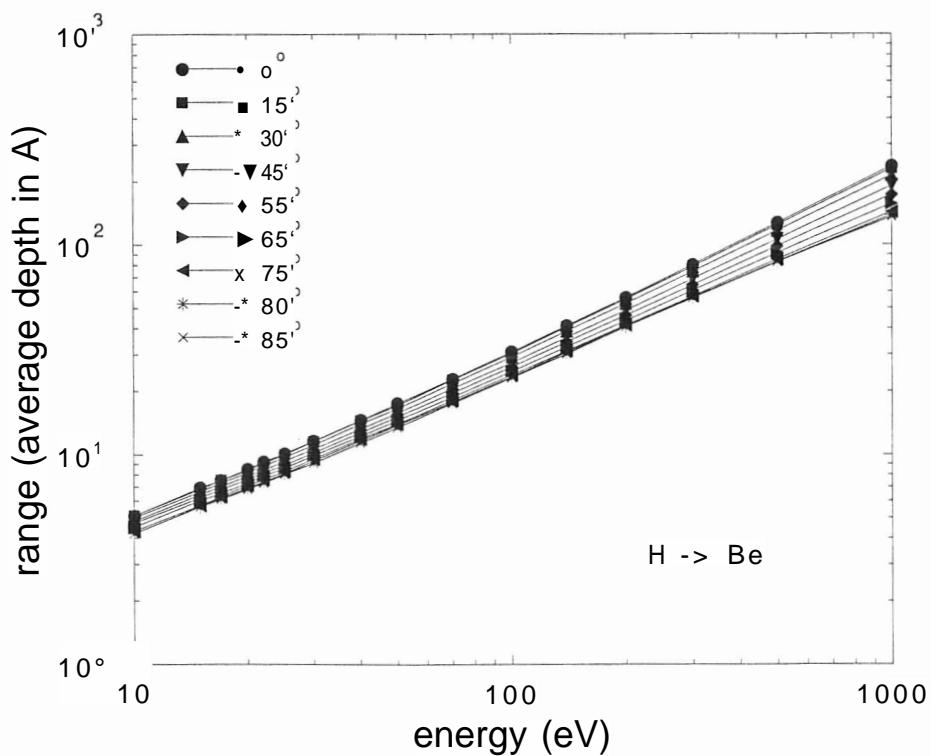
Sputter yield of Be by D

zl= 1 , ml= 2.01 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=18,   na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
11	.00003	.00003	.00003	.00003	.00002	.00001	.00000	.00000	.00000
12	.00009	.00011	.00013	.00011	.00009	.00005	.00002	.00001	.00001
13	.00023	.00027	.00035	.00032	.00026	.00016	.00008	.00005	.00003
14	.00047	.00055	.00069	.00069	.00059	.00039	.00019	.00012	.00008
15	.00081	.00094	.00121	.00129	.00112	.00080	.00041	.00026	.00017
17	.00173	.00202	.00260	.00303	.00292	.00229	.00125	.00077	.00046
20	.00364	.00419	.00546	.00703	.00746	.00659	.00376	.00214	.00116
25	.00730	.00825	.01112	.01569	.01870	.01847	.01082	.00551	.00251
30	.01081	.01218	.01691	.02542	.03254	.03464	.02073	.01015	.00382
40	.01677	.01899	.02644	.04340	.06082	.07174	.04541	.02121	.00591
50	.02094	.02401	.03451	.05777	.08525	.10670	.07398	.03233	.00737
70	.02631	.03039	.04431	.07941	.11930	.16040	.12800	.05897	.00951
100	.03097	.03592	.05421	.09784	.14910	.21330	.20040	.10060	.01270
140	.03317	.03939	.06114	.10780	.16800	.24800	.27060	.15970	.01820
200	.03508	.04031	.06321	.11400	.17670	.26790	.34160	.24320	.02934
300	.03438	.04204	.06343	.11150	.17510	.27240	.39090	.34180	.05711
500	.03243	.03852	.05816	.10400	.15890	.25710	.40770	.43910	.13770
1000	.02529	.02962	.04367	.07800	.12460	.20610	.36540	.45910	.33350
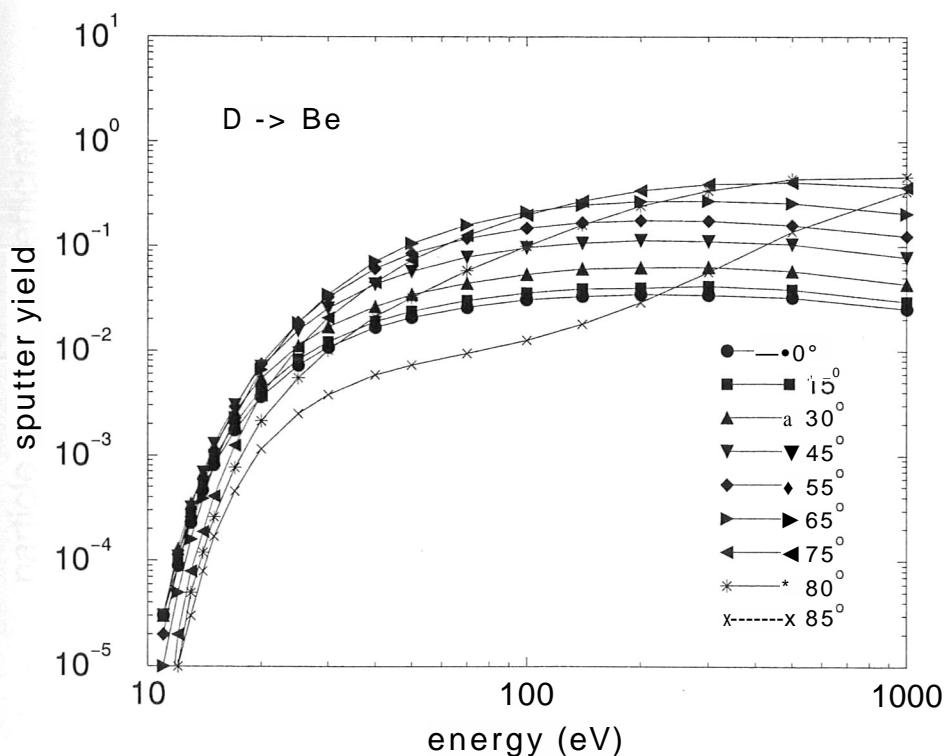
Sputtered energy of Be by D
z1= 1 . m1= 2.01 , z2= 4 , m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=17, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
12	.00000	.00001	.00001	.00001	.00001	.00001	.00000	.00000	.00000
13	.00001	.00002	.00003	.00003	.00002	.00002	.00001	.00001	.00000
14	.00003	.00004	.00005	.00006	.00006	.00004	.00002	.00001	.00001
15	.00005	.00006	.00009	.00011	.00011	.00008	.00005	.00003	.00002
17	.00011	.00014	.00021	.00029	.00031	.00026	.00015	.00009	.00006
20	.00025	.00031	.00046	.00070	.00081	.00079	.00049	.00029	.00016
25	.00053	.00064	.00097	.00156	.00209	.00232	.00153	.00083	.00040
30	.00079	.00093	.00144	.00249	.00356	.00436	.00304	.00159	.00064
40	.00120	.00142	.00212	.00397	.00630	.00866	.00666	.00339	.00101
50	.00143	.00168	.00260	.00494	.00818	.01214	.01038	.00502	.00126
70	.00160	.00188	.00295	.00587	.01001	.01586	.01579	.00845	.00153
100	.00163	.00195	.00304	.00618	.01067	.01781	.02071	.01219	.00184
140	.00148	.00182	.00294	.00589	.01015	.01722	.02295	.01581	.00226
200	.00130	.00148	.00257	.00521	.00888	.01524	.02313	.01915	.00303
300	.00101	.00124	.00207	.00414	.00729	.01224	.02062	.02034	.00456
500	.00066	.00080	.00142	.00303	.00499	.00891	.01584	.01853	.00733
1000	.00032	.00039	.00072	.00147	.00271	.00493	.00933	.01249	.01035
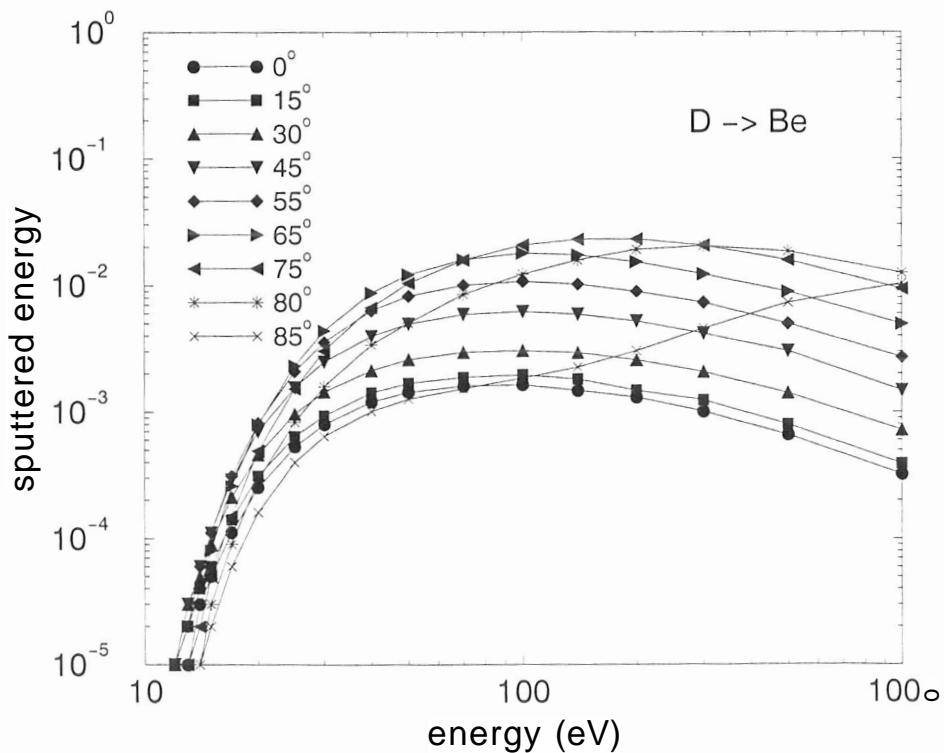
Particle reflection coefficient of D by Be
Zl= 1 , ml= 2.01 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=18, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
11	.29680	.32267	.39986	.54487	.67394	.81188	.92091	.95209	.96822
12	.28930	.31433	.38985	.53424	.66559	.80829	.92282	.95534	.97151
13	.28212	.30641	.38053	.52348	.65676	.80400	.92395	.95772	.97431
14	.27570	.29902	.37160	.51307	.64778	.79903	.92429	.95960	.97655
15	.26962	.29224	.36316	.50294	.63866	.79373	.92436	.96105	.97842
17	.25839	.28003	.34810	.48431	.62075	.78265	.92326	.96311	.98129
20	.24500	.26552	.32941	.46002	.59539	.76420	.91999	.96472	.98437
25	.22732	.24570	.30460	.42624	.55830	.73394	.91183	.96560	.98744
30	.21416	.23189	.28782	.40115	.52708	.70578	.90203	.96422	.98932
40	.19478	.21028	.26132	.36428	.48074	.65592	.87982	.96000	.99145
50	.18131	.19583	.24410	.34125	.44865	.61693	.85612	.95329	.99236
70	.16297	.17626	.21896	.30688	.40493	.55820	.80889	.93818	.99309
100	.14349	.15754	.19950	.27666	.36471	.50261	.74837	.90989	.99261
140	.12948	.14059	.18490	.25316	.33516	.46137	.68487	.86843	.99061
200	.11167	.12242	.15865	.23006	.30860	.42406	.62155	.81010	.98570
300	.09354	.10350	.13658	.20484	.28137	.39027	.56376	.73530	.97224
500	.07197	.08047	.10977	.17230	.24554	.34701	.50934	.64867	.93231
1000	.04378	.05037	.07366	.12720	.19170	.29366	.44456	.56618	.82260
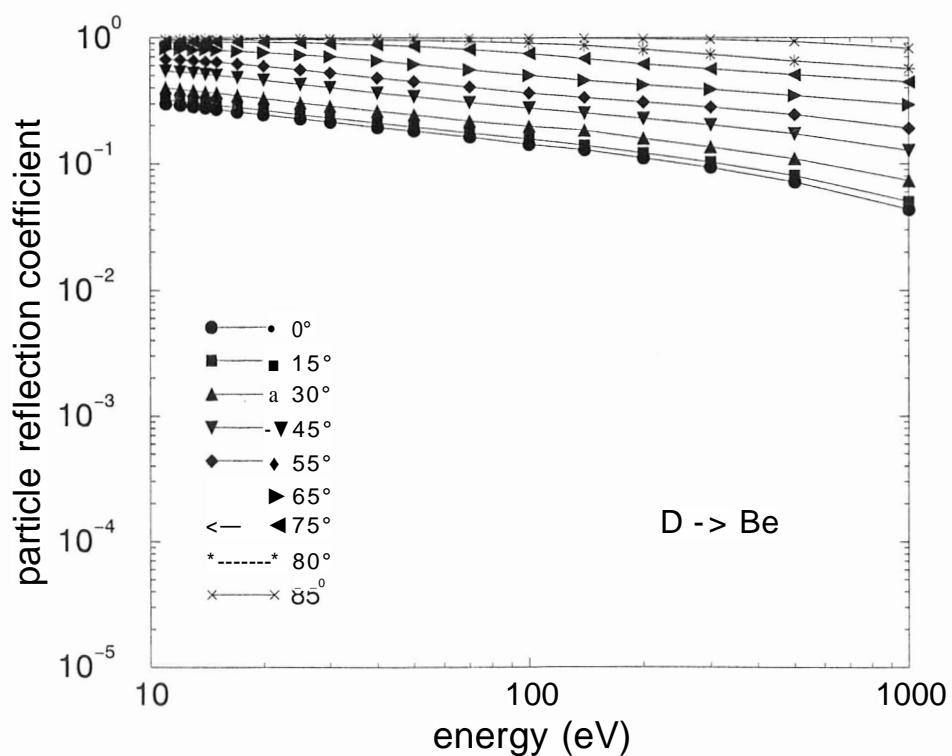
Energy reflection coefficient of D by Be

zl= 1 , ntl= 2.01 , z2= 4 . m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=18. na=9

E_o (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
11	.09600	.11142	.16212	.27327	.39166	.54180	.69256	.74681	.77912
12	.09403	.10887	.15821	.26867	.38922	.54474	.70383	.76123	.79473
13	.09191	.10630	.15442	.26343	.38552	.54600	.71286	.77332	.80839
14	.08998	.10367	.15042	.25794	.38109	.54586	.72004	.78362	.82005
15	.08798	.10126	.14667	.25250	.37607	.54464	.72600	.79246	.83027
17	.08428	.09674	.13973	.24165	.36498	.54011	.73441	.80666	.84719
20	.07964	.09111	.13074	.22677	.34796	.52878	.74132	.82198	.86639
25	.07328	.08340	.11885	.20604	.32122	.50668	.14361	.83806	.88811
30	.06843	.07792	.11050	.19016	.29739	.48306	.73985	.84629	.90253
40	.06142	.06939	.09799	.16683	.26209	.43882	.72197	.85245	.92022
50	.05657	.06392	.08969	.15199	.23768	.40235	.69839	.85069	.93031
70	.05009	.05651	.07898	.13258	.20564	.34844	.64736	.83664	.94082
100	.04346	.04936	.07055	.11585	.17767	.29831	.57847	.80370	.94677
140	.03861	.04354	.06137	.10373	.15803	.26208	.50730	.75174	.94786
200	.03269	.03731	.05424	.09197	.14115	.23097	.43639	.67785	.94306
300	.02662	.03058	.04468	.07877	.12416	.20400	.37278	.58419	.92438
500	.01960	.02280	.03427	.06319	.10235	.17109	.31491	.47586	.86694
1000	.01100	.01304	.02096	.04244	.07189	.13104	.24945	.37136	.70820
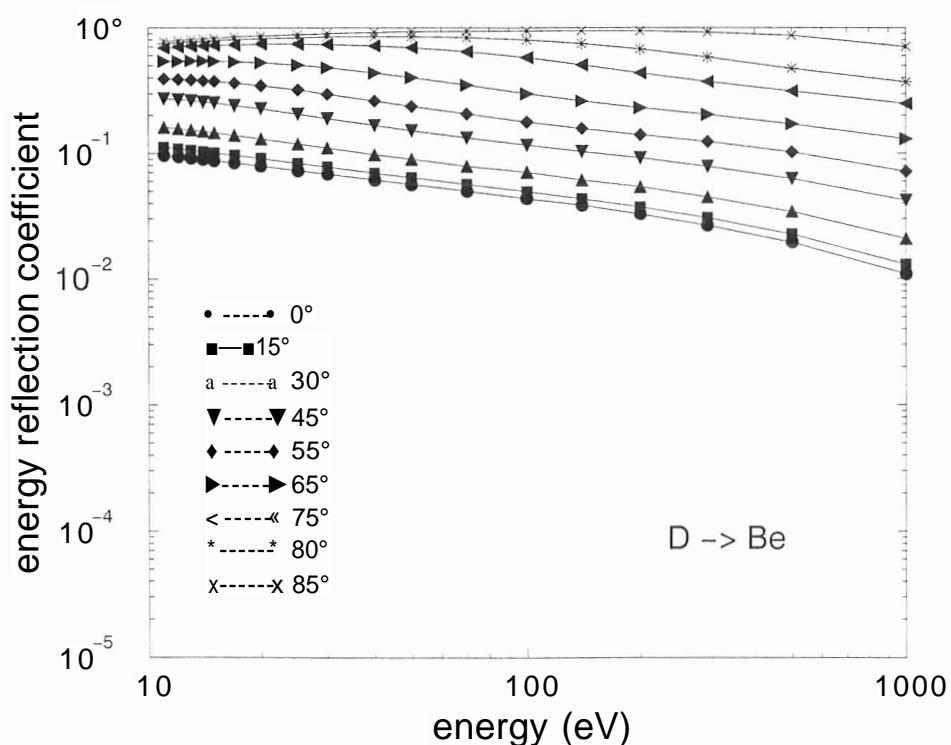
Average depth of implanted D in Be

z1= 1 , m1= 2.01 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=18, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
11	4.5	4.5	4.3	4.1	3.9	3.6	3.4	3.2	3.1
12	4.9	4.8	4.6	4.3	4.1	3.9	3.6	3.5	3.4
13	5.2	5.1	4.9	4.6	4.4	4.1	3.9	3.7	3.6
14	5.5	5.4	5.2	4.9	4.7	4.4	4.1	3.9	3.8
15	5.8	5.7	5.5	5.1	4.9	4.6	4.3	4.2	4.0
17	6.4	6.3	6.0	5.7	5.4	5.1	4.8	4.6	4.4
20	7.2	7.1	6.8	6.4	6.1	5.7	5.4	5.2	5.0
25	8.6	8.5	8.1	7.6	7.2	6.8	6.4	6.2	6.0
30	9.9	9.8	9.4	8.7	8.3	7.8	7.4	7.1	6.8
40	12.6	12.4	11.8	11.0	10.4	9.8	9.2	8.9	8.6
50	15.2	14.9	14.2	13.1	12.4	11.7	11.0	10.6	10.2
70	20.2	19.8	18.9	17.4	16.3	15.4	14.5	14.1	13.4
100	27.6	27.1	25.7	23.7	22.1	20.7	19.4	18.8	18.5
140	37.5	36.9	34.7	31.8	29.7	27.7	26.0	25.2	24.2
200	52.2	51.2	48.2	44.1	40.8	37.9	35.2	34.3	33.3
300	76.8	75.1	70.7	64.0	58.8	54.4	50.3	49.0	48.5
500	126.2	123.5	115.3	103.3	94.7	86.6	79.4	76.9	76.0
1000	250.8	244.6	225.5	199.2	180.5	161.1	145.2	139.4	136.9
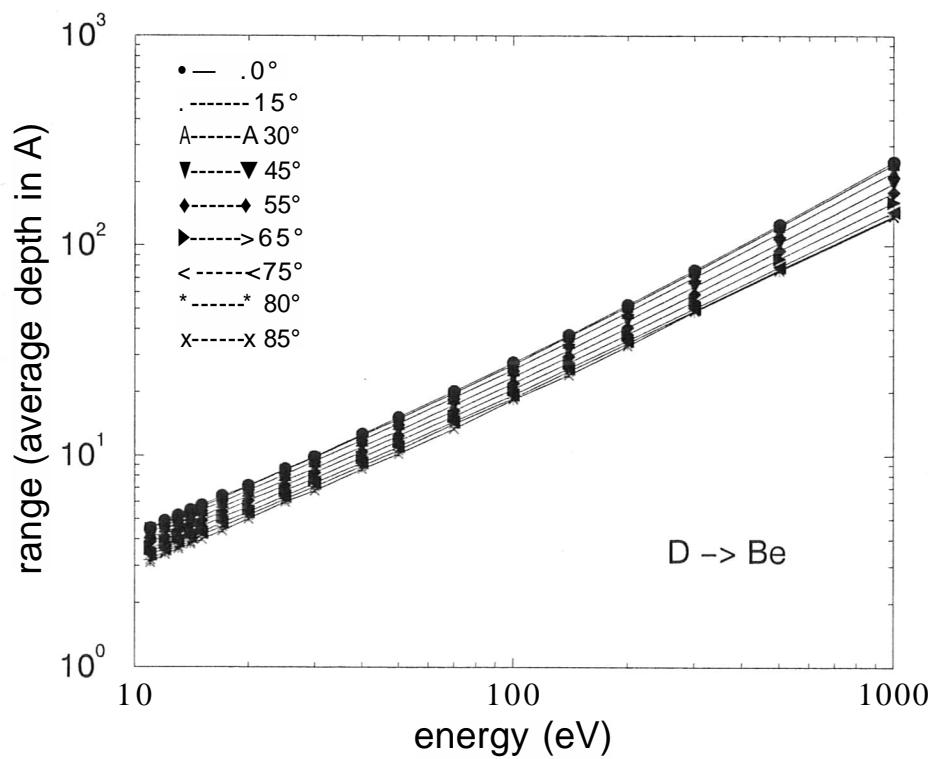
Sputter yield of Be by T
zl= 1 , ml= 3.02 , z2= 4 , m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00002	.00003	.00004	.00005	.00005	.00005	.00003	.00003	.00002
11	.00007	.00010	.00015	.00018	.00020	.00018	.00013	.00010	.00008
12	.00018	.00024	.00038	.00049	.00053	.00050	.00037	.00027	.00020
13	.00035	.00047	.00074	.00102	.00115	.00109	.00077	.00057	.00041
15	.00090	.00120	.00198	.00292	.00346	.00343	.00237	.00161	.00107
17	.00174	.00228	.00371	.00605	.00730	.00759	.00498	.00316	.00195
20	.00343	.00439	.00728	.01237	.01602	.01697	.01055	.00607	.00328
25	.00683	.00860	.01416	.02544	.03519	.03865	.02308	.01191	.00534
30	.01033	.01288	.02121	.03957	.05620	.06359	.03853	.01875	.00722
50	.02114	.02564	.04261	.08412	.12810	.16100	.10980	.04782	.01094
100	.03272	.04023	.06878	.13270	.20970	.29780	.27270	.13560	.01716
200	.03995	.04939	.08170	.15540	.24400	.37280	.46330	.32360	.03821
300	.04135	.05064	.08224	.15450	.23810	.37780	.52970	.46670	.07570
500	.04046	.04848	.07704	.14100	.22240	.35610	.56120	.59870	. L8320
1000	.03378	.03942	.06094	.11190	.17300	.28840	.50080	.64190	.45170
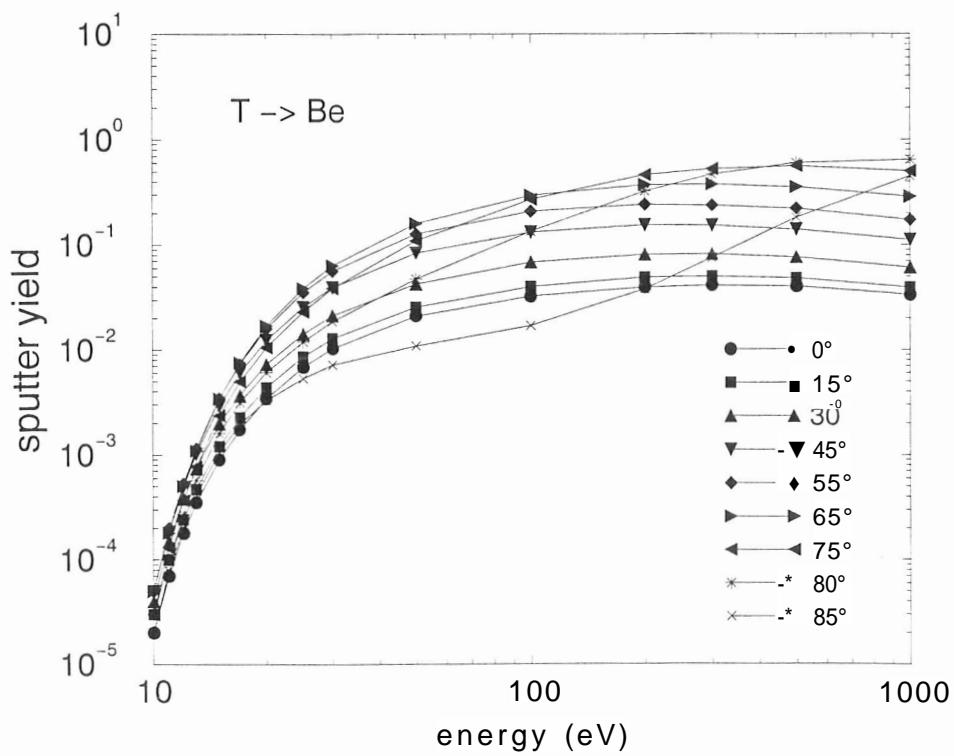
Sputtered energy of Be by T
$_z1= 1$, ml= 3.0'2, z'2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00000	.00001	.00001	.00001	.00000	.00000	.00000
11	.00000	.00001	.00001	.00002	.00002	.00002	.00002	.00002	.00001
1'2	.00001	.00002	.00004	.00007	.00007	.00007	.00005	.00004	.00003
13	.00003	.00004	.00007	.00012	.00015	.00016	.00012	.00009	.00007
15	.00007	.00010	.00020	.00036	.00047	.00052	.00039	.00027	.00018
17	.00013	.00019	.00038	.00075	.00103	.00119	.00085	.00057	.00036
20	.00026	.00037	.00075	.00156	.00229	.00275	.00193	.00116	.00065
25	.00052	.00072	.00140	.00309	.00493	.00630	.00440	.00245	.00114
30	.00078	.00104	.00203	.00460	.00758	.01017	.00744	.00392	.00158
50	.00142	.00184	.00338	.00804	.01449	.02204	.01886	.00922	.00230
100	.00169	.00213	.00407	.00935	.01694	.02856	.03288	.01941	.00288
200	.00142	.00183	.00348	.00797	.01394	.02419	.03607	.02930	.00446
300	.00116	.00150	.00284	.00641	.01104	.01950	.03189	.03191	.00681
500	.00082	.00104	.00202	.00449	.00799	.01410	.02481	.02925	.OHIO
1000	.00043	.00056	.00108	.00242	.00434	.00814	.01534	.02052	.01590
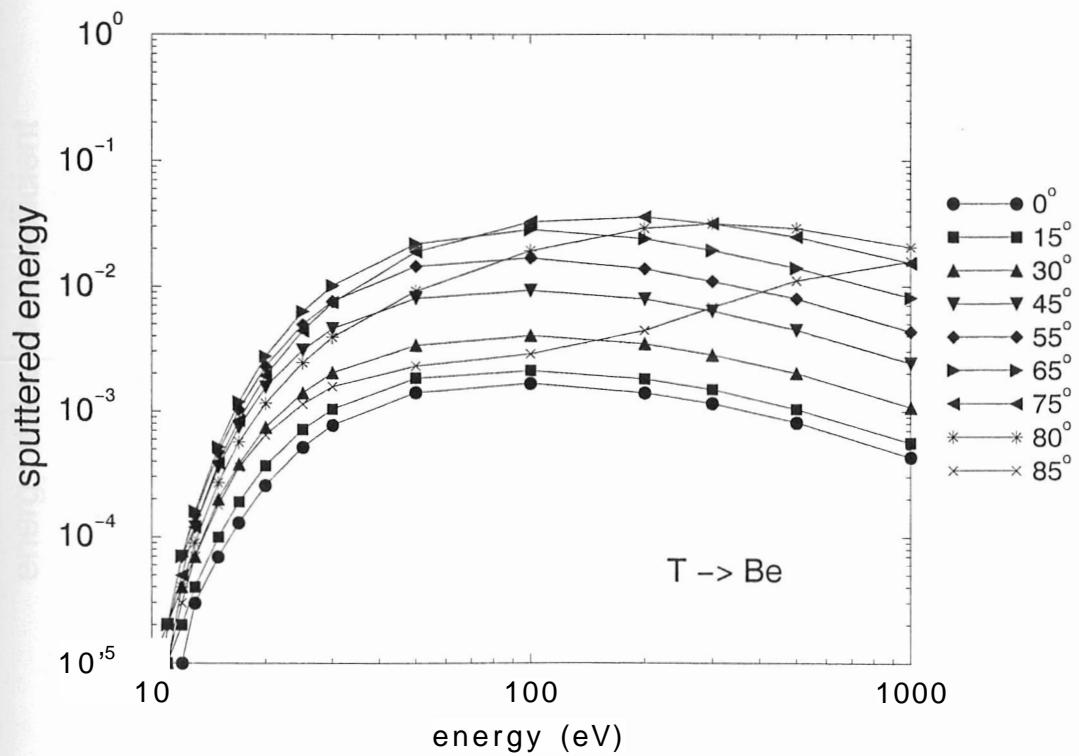
Particle reflection coefficient of T by Be
z1= 1 , ml= 3.02 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=15, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.20571	.23284	.31458	.47049	.61247	.76552	.89047	.92772	.94767
11	.20408	.23006	.31001	.46525	.60944	.76743	.89749	.93575	.95575
12	.20118	.22619	.30441	.45824	.60431	.76702	.90208	.94162	.96173
13	.19768	.22181	.29796	.45057	.59795	.76482	.90530	.94601	.96627
15	.18993	.21247	.28524	.43370	.58331	.75763	.90843	.95195	.97283
17	.18247	.20400	.27301	.41733	.56649	.7473i	.90898	.95559	.97703
20	.17242	.19168	.25711	.39440	.54232	.73073	.90755	.95852	.98137
25	.15895	.17708	.23655	.36289	.50539	.70054	.89977	.96034	.98558
30	.14860	.16549	.22047	.33810	.47413	.67122	.88998	.95939	.98789
50	.12308	.13680	.18297	.27945	.39302	.57587	.84106	.94918	.99165
100	.09570	.10694	.14376	.22408	.31182	.45930	.72566	.90096	.99187
200	.07273	.08197	.11411	.18294	.25928	.37821	.59063	.79647	.98478
300	.06041	.06851	.09845	.16118	.23467	.34574	.53224	.71599	.97106
500	.04615	.05272	.07917	.13615	.20501	.30882	.47755	.62709	.92858
1000	.02861	.03386	.05474	.10280	.16462	.26340	.42204	.54478	.81435
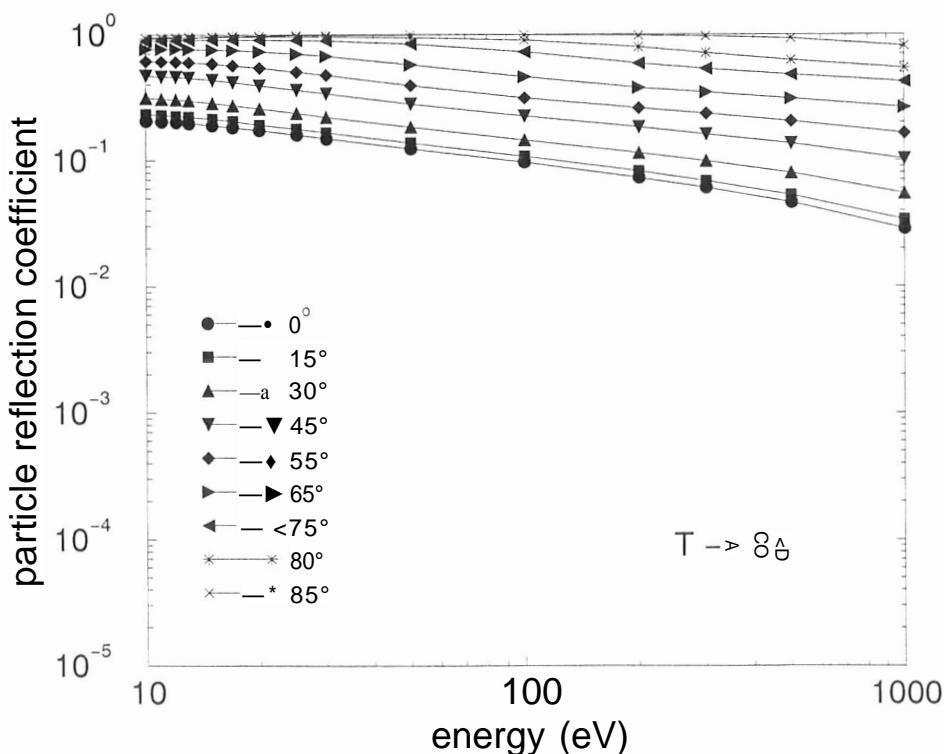
Energy reflection coefficient of T by Be

zl= 1 , ml= 3.02 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne—15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.04432	.05682	.09980	.19945	.31053	.45610	.60760	.66402	.69822
11	.04484	.05691	.09906	.19888	.31299	.46517	.62644	.68673	.72300
12	.04491	.05655	.09768	.19689	.31318	.47124	.64146	.70558	.74386
13	.04471	.05591	.09582	.19413	.31186	.47495	.65382	.72143	.76157
15	.04375	.05413	.09187	.18709	.30641	.47782	.67204	.74654	.79018
17	.04250	.05224	.08773	.17952	.29834	.47587	.68432	.76540	.81218
20	.04053	.04925	.08210	.16793	.28465	.46864	.69591	.78585	.83722
25	.03752	.04531	.07449	.15165	.26186	.45006	.70234	.80746	.86584
30	.03507	.04225	.06860	.13852	.24191	.42866	.70083	.81931	.88465
50	.02872	.03429	.05493	.10808	.18773	.35209	.66303	.83023	.92124
100	.02208	.02616	.04154	.08144	.13658	.25512	.54409	.78377	.94344
200	.01649	.01978	.03237	.06422	.10739	.19266	.40228	.65741	.94137
300	.01367	.01634	.02747	.05530	.09511	.17014	.34229	.56091	.92291
500	.01012	.01232	.02147	.04520	.07995	.14526	.28850	.45462	.86335
1000	.00595	.00751	.01394	.03181	.05959	.11432	.23465	.35770	.70432
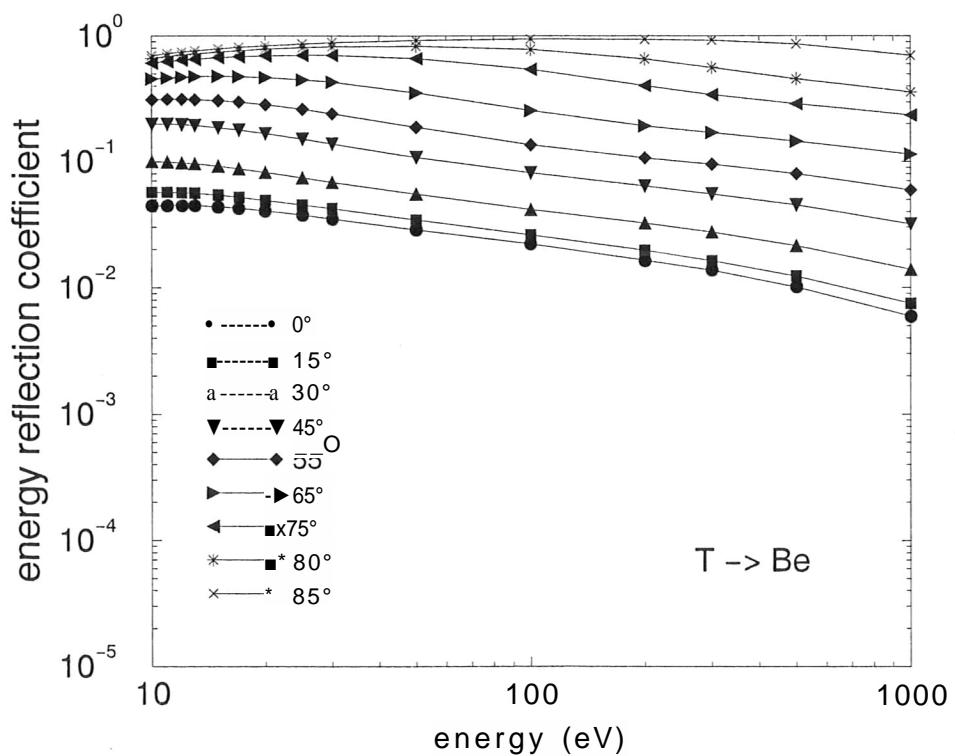
Average depth of implanted T in Be
zl= 1 , ml= 3.02 , z2= 4 , m2= 9.01 , Es=3,38   , rho=1.80 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	3.3	3.3	3.3	3.3	2.2	2.2	2.2	2.2	2.0
11	4.4	4.4	3.3	3.3	3.3	2.2	2.2	2.2	2.2
12	4.4	4.4	4.4	3.3	3.3	3.3	2.2	2.2	2.4
13	4.4	4.4	4.4	4.4	3.3	3.3	3.3	2.2	2.7
15	5.5	5.5	4.4	4.4	4.4	3.3	3.3	3.3	3.0
17	5.5	5.5	5.5	4.4	4.4	4.4	3.3	3.3	3.4
20	6.6	6.6	6.6	5.5	5.5	4.4	4.4	4.4	3.9
25	7.7	7.7	7.7	6.6	6.6	5.5	5.5	5.5	4.7
30	9.9	8.8	8.8	7.7	7.7	6.6	6.6	5.5	5.5
50	13.3	13.3	12.2	11.1	10.0	10.0	9.9	8.8	8.3
100	25.5	25.5	23.3	21. L	19.9	17.7	16.6	15.5	14.7
200	48.8	47.7	44.4	39.9	36.6	33.3	30.0	29.9	28.3
300	72.2	70.0	65.5	58.8	53.3	48.8	44.4	42.2	40.9
500	121.1	118.8	109.9	96.6	87.7	78.8	71.1	68.8	65.9
1000	248.8	241.1	222.2	193.3	172.2	152.2	136.6	129.9	125.3
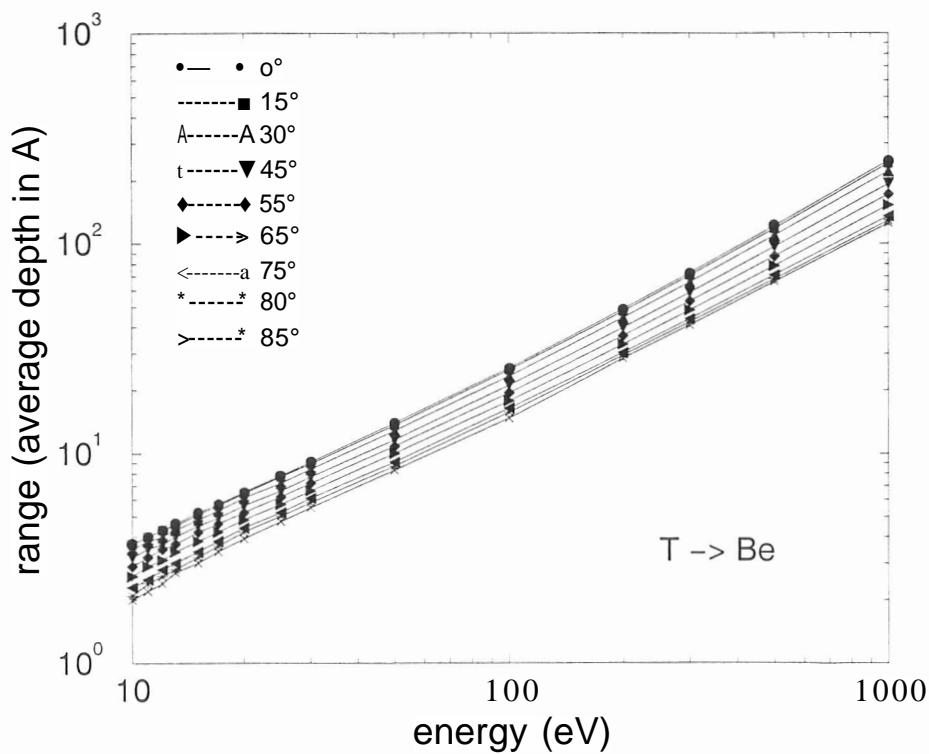
Sputter yield of Be by He

zl= 2 , m1= 4.00 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=23, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00001	.00002	.00002	.00002	.00002	.00001	.00000	.00000
11	.00002	.00003	.00007	.00008	.00009	.00009	.00004	.00001	.00000
12	.00004	.00008	.00010	.00020	.00026	.00029	.00011	.00002	.00000
13	.00009	.00015	.00028	.00046	.00065	.00069	.00024	.00004	.00000
15	.00031	.00048	.00090	.00170	.00248	.00244	.00074	.00013	.00000
17	.00082	.00121	.00232	.00443	.00616	.00582	.00164	.00026	.00000
20	.00227	.00325	.00623	.01203	.01590	.01401	.00368	.00054	.00000
25	.00628	.00890	.01684	.03188	.04162	.03499	.00872	.00128	.00001
30	.01158	.01574	.03024	.05752	.07301	.06241	.01621	.00235	.00002
40	.02350	.03114	.05755	.11020	.14140	.12660	.03682	.00516	.00003
50	.03421	.04467	.08118	.15560	.20460	.19400	.06223	.00925	.00005
70	.05026	.06533	.11720	.22420	.30400	.31620	.12500	.02119	.00010
100	.06758	.08772	.15390	.28990	.40470	.46570	.23500	.04837	.00025
140	.08314	.10430	.18160	.33930	.48500	.59780	.38760	.10400	.00058
200	.09595	.12030	.20080	.37120	.54800	.72250	.59850	.21110	.00169
300	.10560	.12970	.21430	.38880	.58260	.82060	.83950	.43420	.00674
400	.10900	.13390	.21300	.39330	.59020	.85620	.99430	.63860	.01684
500	.11020	.13570	.21210	.38820	.58550	.86440	1.08800	.81190	.03604
700	.10890	.12990	.20620	.36640	.56070	.84900	1.18300	1.06300	.10560
1000	.10390	.12520	.18890	.33730	.52100	.81830	1.20900	1.24000	.27650
2000	.08698	.10030	.14790	.26160	.40270	.66650	1.10100	1.35600	.90010
5000	.05928	.06596	.09391	.15790	.23790	.40770	.76550	1.08900	1.37300
10000	.04080	.04516	.06050	.09413	.14220	.23770	.48730	.75270	1.22600
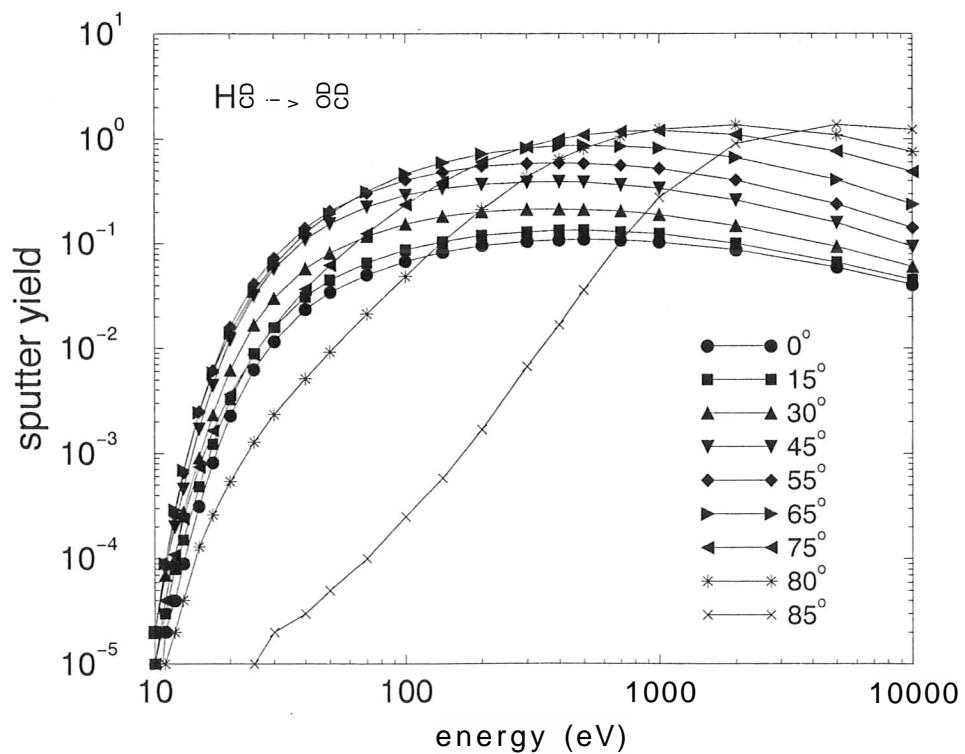
Sputtered energy of Be by He

z1= 2 , m1= 4.00 . z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=22. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
11	.00000	.00000	.00001	.00001	.00001	.00001	.00001	.00000	.00000
12	.00000	.00001	.00001	.00002	.00003	.00004	.00002	.00000	.00000
13	.00001	.00001	.00003	.00006	.00009	.00011	.00004	.00001	.00000
15	.00002	.00004	.00010	.00022	.00037	.00040	.00014	.00002	.00000
17	.00006	.00011	.00026	.00061	.00096	.00103	.00033	.00005	.00000
20	.00018	.00029	.00071	.00169	.00260	.00262	.00079	.00012	.00000
25	.00047	.00077	.00187	.00449	.00694	.00681	.00198	.00030	.00000
30	.00085	.00131	.00321	.00787	.01186	.01218	.00375	.00054	.00000
40	.00160	.00238	.00546	.01363	.02139	.02363	.00837	.00125	.00001
50	.00217	.00311	.00701	.01754	.02827	.03339	.01350	.00212	.00001
70	.00282	.00398	.00865	.02152	.03570	.04660	.02378	.00448	.00002
100	.00322	.00452	.00956	.02304	.03892	.05542	.03691	.00880	.00004
140	.00339	.00455	.00958	.02277	.03841	.05698	.04897	.01576	.00048
200	.00319	.00441	.00888	.02065	.03553	.05528	.05891	.02528	.00022
300	.00283	.00379	.00767	.01762	.03032	.04952	.06253	.03848	.00073
400	.00246	.00343	.00671	.01553	.02665	.04403	.06010	.04584	.00155
500	.00227	.00309	.00595	.01361	.02345	.03977	.05819	.04985	.00290
700	.00180	.00241	.00490	.01101	.01912	.03250	.05144	.05127	.00664
1000	.00139	.00194	.00372	.00861	.01500	.02674	.04351	.04753	.01346
2000	.00076	.00102	.00203	.00474	.00854	.01606	.02838	.03528	.02475
5000	.00028	.00037	.00075	.00179	.00326	.00647	.01303	.01876	.02084
10000	.00012	.00016	.00033	.00071	.00132	.00253	.00601	.00939	.01277
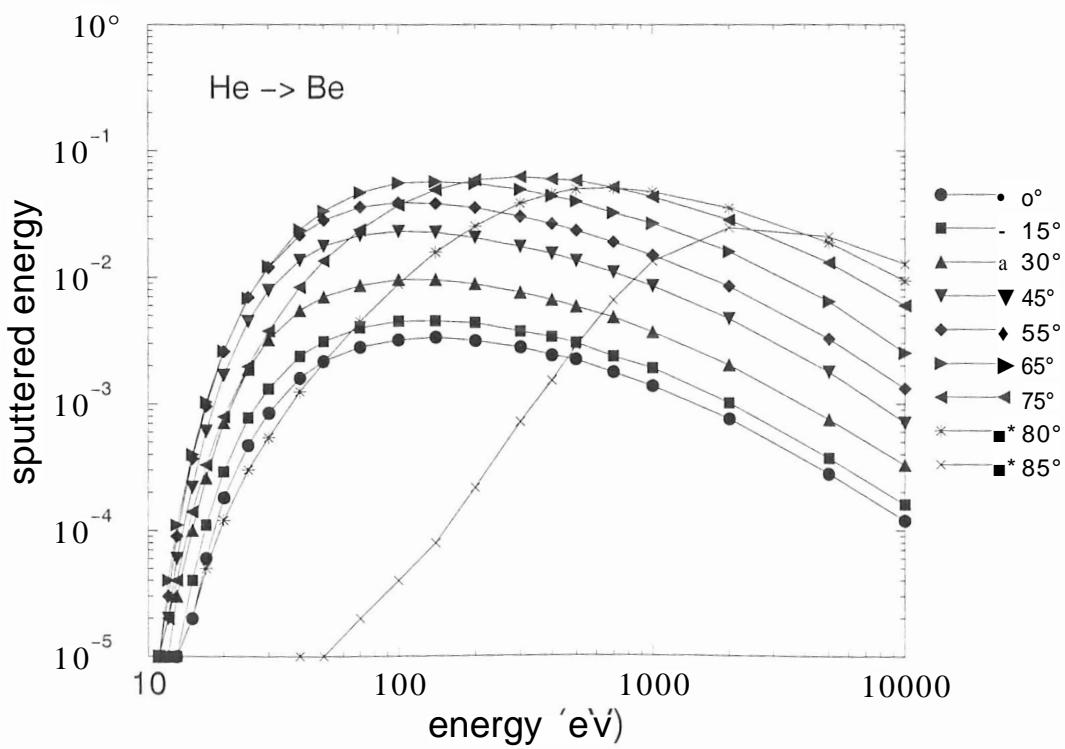
Particle reflection coefficient of He by Be

z1= 2 , m1= 4.00 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80   g/cm**3 ; ne=23, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.31534	.35507	.46158	.64361	.78758	.92006	.98995	.99887	.99999
11	.30510	.34361	.44907	.63212	.77885	.91633	.98968	.99888	.99999
12	.29450	.33190	.43639	.62026	.76972	.91240	.98938	.99888	1.00000
13	.28400	.32022	.42375	.60830	.76057	.90842	.98891	.99887	1.00000
15	.26434	.29843	.39912	.58452	.74189	.89899	.98808	.99883	1.00000
17	.24681	.27913	.37645	.56146	.72319	.88967	.98701	.99876	1.00000
20	.22462	.25413	.34720	.52896	.69576	.87365	.98507	.99863	1.00000
25	.19716	.22273	.30752	.48197	.65206	.84713	.98137	.99835	1.00000
30	.17707	.20022	.27689	.44147	.61221	.82132	.97642	.99792	.99999
40	.14982	.16874	.23591	.38097	.54800	.76905	.96479	.99699	.99999
50	.13175	.14993	.20798	.34037	.49796	.72116	.95175	.99555	.99999
70	.11041	.12501	.17521	.28513	.42479	.64240	.92073	.99158	.99999
100	.09220	.10466	.14814	.24439	.35899	.55794	.86814	.98208	.99997
140	.07913	.08691	.12640	.21008	.30811	.48741	.79982	.96352	.99993
200	.06606	.07434	.10911	.18237	.27447	.41917	.71297	.92695	.99979
300	.05404	.06339	.09138	.15835	.23736	.36802	.62104	.85662	.99894
400	.04626	.05551	.08122	.14193	.21774	.33734	.56222	.79293	.99713
500	.04174	.04986	.07426	.13402	.20453	.32036	.52604	.74110	.99342
700	.03430	.04096	.06387	.11657	.18527	.29500	.48060	.66307	.97943
1000	.02787	.03315	.05388	.10319	.16814	.27061	.44334	.60021	.94205
2000	.01665	.02049	.03537	.07536	.13098	.22619	.38589	.51520	.80453
5000	.00659	.00827	.01618	.04098	.08207	.16648	.31951	.44010	.64329
10000	.00286	.00354	.00696	.02058	.04799	.11392	.26262	.38498	.56887
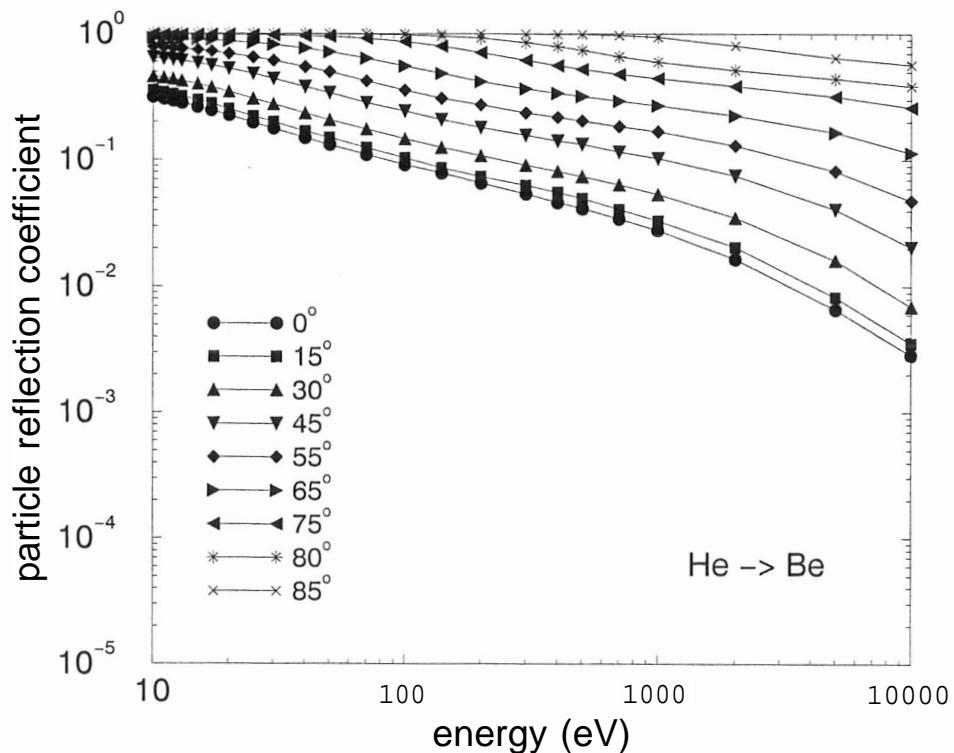
Energy reflection coefficient of He by Be

z1= 2 , m1= 4.00 . z2= 4 , m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=23, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.04874	.06662	.12390	.25031	.39059	.58526	.79863	.88593	.94835
11	.04761	.06469	.12076	.24707	.38841	.58572	.80286	.89047	.95212
12	.04636	.06274	.11750	.24337	.38547	.58555	.80624	.89434	.95515
13	.04508	.06075	.11419	.23923	.38205	.58479	.80891	.89770	.95786
15	.04256	.05696	.10752	.23045	.37427	.58091	.81296	.90305	.96191
17	.04017	.05344	.10124	.22121	.36553	.57633	.81537	.90708	.96495
20	.03699	.04882	.09287	.20709	.35120	.56646	.81683	.91144	.96806
25	.03282	.04282	.08125	.18650	.32711	.54797	.81612	.91585	.97173
30	.02968	.03846	.07213	.16827	.30358	.52819	.81173	.91821	.97837
40	.02526	.03208	.05980	.14029	.26387	.48751	.79909	.91953	.97686
50	.02213	.02831	.05181	.12082	.23322	.44895	.78301	.91776	.97823
70	.01847	.02332	.04234	.09729	.18950	.38480	.74593	.91075	.97936
100	.01548	.01938	.03469	.07913	.15099	.31598	.68483	.89429	.97947
140	.01299	.01605	.02921	.06624	.12372	.25993	.61008	.86439	.97874
200	.01096	.01379	.02503	.05560	.10455	.21124	.51646	.81327	.97699
300	.00904	.01164	.02052	.04750	.08751	.17451	.42015	.72163	.97284
400	.00768	.01001	.01847	.04151	.07818	.15508	.36213	.64263	.96728
500	.00694	.00910	.01672	.03857	.07288	.14283	.32403	.57925	.95901
700	.00567	.00740	.01435	.03349	.06452	.12877	.28149	.48832	.93406
1000	.00458	.00591	.01174	.02926	.05701	.11429	.24847	.41633	.87790
2000	.00262	.00349	.00742	.01991	.04143	.08848	.19957	.32110	.68360
5000	.00093	.00128	.00296	.00922	.02199	.05479	.14102	.23599	.45962
10000	.00037	.00049	.00113	.00392	.01034	.03007	.09458	.17370	.35014

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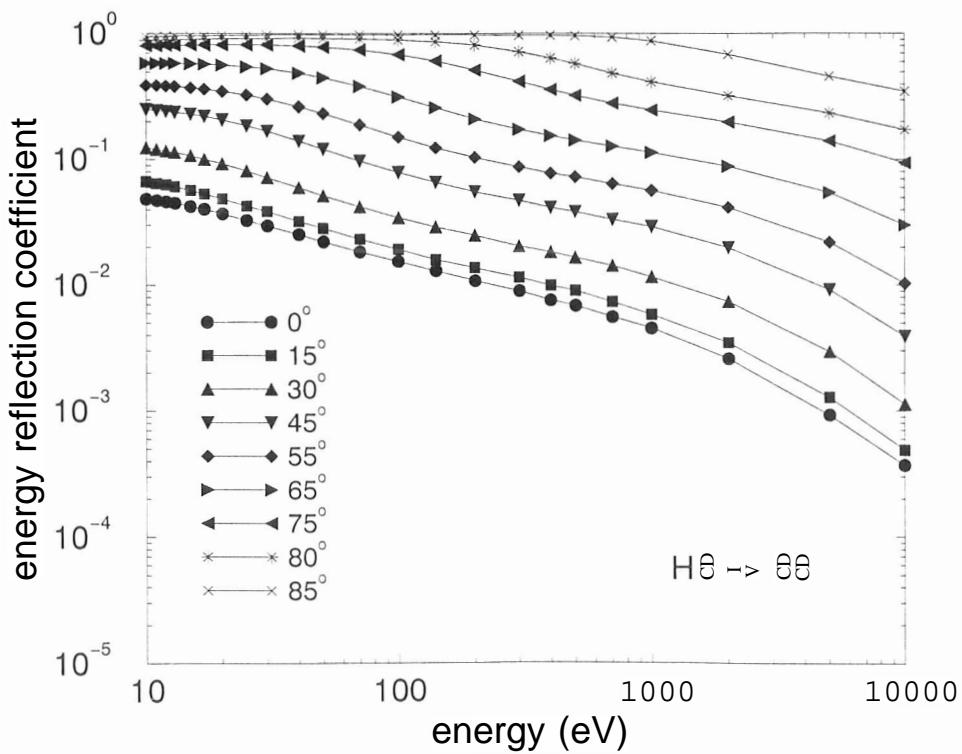
Average depth of implanted He in Be

z1= 2 , m1= 4.00 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=23, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	2.2	2.2	2.2	2.2	1.1	1.1	1.1	1.1	0.6
11	2.2	2.2	2.2	2.2	2.2	1.1	1.1	1.1	0.7
12	2.2	2.2	2.2	2.2	2.2	1.1	1.1	1.1	0.8
13	2.2	2.2	2.2	2.2	2.2	2.2	1.1	1.1	0.9
15	3.3	3.3	3.3	2.2	2.2	2.2	1.1	1.1	1.1
17	3.3	3.3	3.3	3.3	2.2	2.2	2.2	1.1	1.3
20	4.4	4.4	3.3	3.3	3.3	2.2	2.2	2.2	1.6
25	4.4	4.4	4.4	4.4	3.3	3.3	2.2	2.2	2.1
30	5.5	5.5	5.5	4.4	4.4	3.3	3.3	3.3	2.5
40	6.6	6.6	6.6	5.5	5.5	4.4	4.4	3.3	3.2
50	8.8	7.7	7.7	6.6	6.6	5.5	5.5	4.4	3.9
70	10.0	10.0	9.9	8.8	8.8	7.7	6.6	6.6	4.6
100	14.4	13.3	12.2	11.1	10.0	9.9	8.8	8.8	6.5
140	18.8	18.8	17.7	15.5	13.3	12.2	11.1	10.0	9.0
200	25.5	25.5	23.3	20.0	18.8	16.6	15.5	14.4	11.8
300	37.7	36.6	33.3	29.9	26.6	23.3	21.1	20.0	18.2
400	48.8	47.7	43.3	38.8	34.4	30.0	27.7	26.6	23.9
500	60.0	58.8	53.3	47.7	42.2	37.7	33.3	32.2	29.7
700	82.2	80.0	74.4	64.4	58.8	51.1	45.5	43.3	41.9
1000	118.8	114.4	105.5	91.1	81.1	71.1	63.3	60.0	58.4
2000	237.7	230.0	210.0	180.0	158.8	137.7	119.9	111.1	108.3
5000	596.6	577.7	521.1	437.7	375.5	314.4	263.3	242.2	230.1
10000	1150.0	1111.1	1000.0	829.9	695.5	562.2	499.9	408.8	378.4
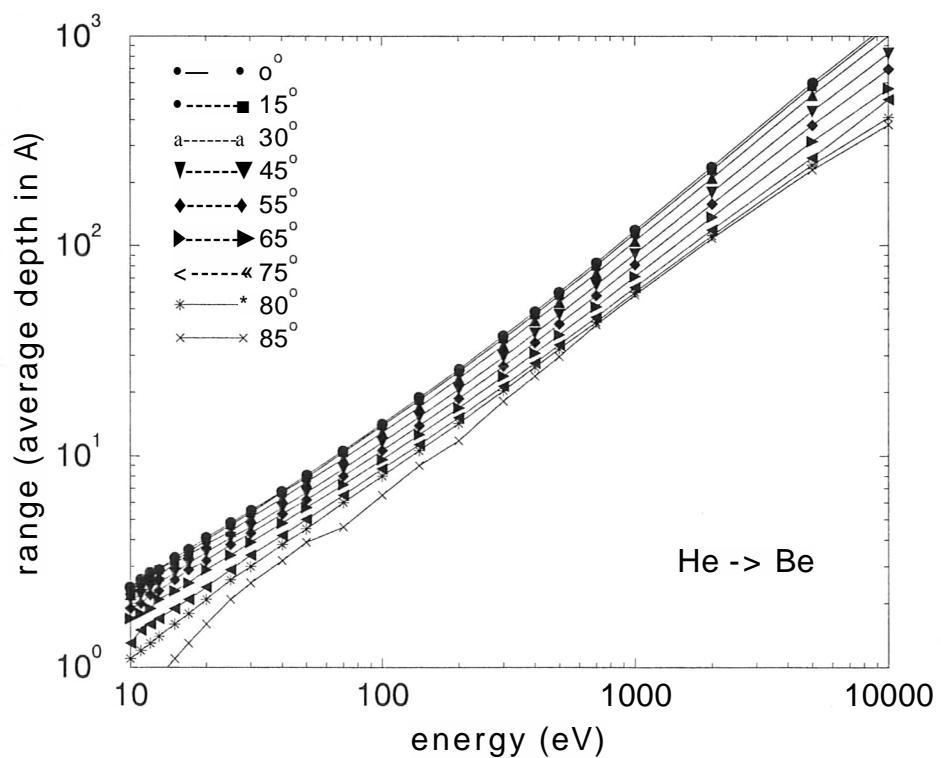
Sputter yield of Be by Be

zl= 4 , m1= 9.01 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=23. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
5	.00000	.00000	.00000	.00000	.00001	.00001	.00001	.00001	.00001
6	.00000	.00000	.00000	.00002	.00004	.00005	.00005	.00005	.00005
7	.00000	.00000	.00001	.00007	.00010	.00012	.00013	.00013	.00014
8	.00000	.00000	.00004	.00013	.00020	.00027	.00035	.00038	.00040
9	.00000	.00001	.00007	.00025	.00039	.00063	.00088	.00096	.00101
10	.00000	.00002	.00013	.00042	.00078	.00137	.00189	.00204	.00217
11	.00001	.00004	.00022	.00074	.00151	.00262	.00347	.00377	.00374
12	.00001	.00007	.00035	.00122	.00271	.00467	.00588	.00600	.00604
13	.00002	.00010	.00054	.00207	.00448	.00729	.00869	.00873	.00884
15	.00005	.00022	.00122	.00495	.00990	.01476	.01608	.01568	.01506
17	.00012	.00044	.00239	.00979	.01792	.02482	.02499	.02353	.02224
20	.00031	.00109	.00563	.02077	.03471	.04382	.04044	.03645	.03329
25	.00109	.00332	.01536	.04769	.07141	.08205	.06870	.05847	.05091
30	.00268	.00727	.02951	.08175	.11640	.12540	.09737	.07918	.06576
40	.00841	.01925	.06539	.15820	.21210	.21510	.15030	.11230	.08647
50	.01681	.03446	.10280	.23270	.30570	.30400	.19890	.13680	.09652
70	.03767	.06718	.17250	.35890	.47040	.47120	.28690	.17340	.10280
100	.07002	.11110	.24910	.49270	.66300	.69410	.42070	.22890	.10590
200	.14250	.19810	.37650	.71830	1.01500	1.21100	.87670	.43750	.11570
300	.18590	.24550	.43710	.81880	1.18600	1.51900	1.29900	.68950	.13670
500	.23330	.29320	.49370	.90340	1.33800	1.85300	1.91800	1.23100	.20800
700	.25740	.31580	.51070	.93010	1.40100	2.00000	2.30900	1.72300	.30850
1000	.27410	.33090	.51910	.93120	1.41300	2.08500	2.64800	2.72000	.51030
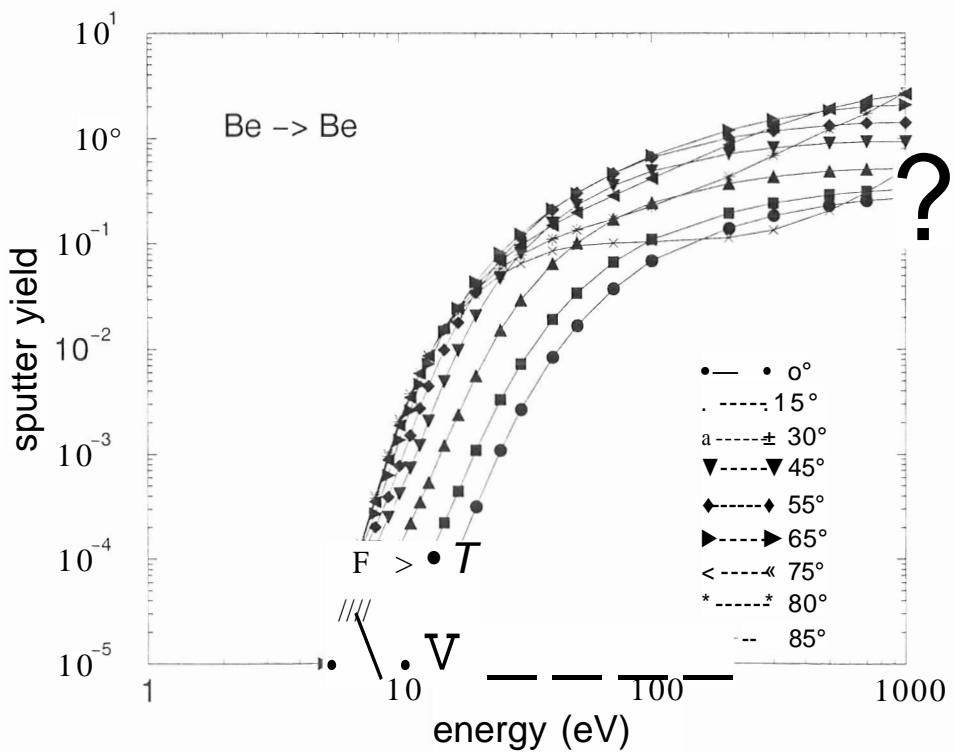
Sputtered energy of Be by Be

z1= 4 , m1= 9.01 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=22, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
6	.00000	.00000	.00000	.00000	.00001	.00001	.00001	.00001	.00001
7	.00000	.00000	.00000	.00001	.00001	.00002	.00002	.00003	.00003
8	.00000	.00000	.00000	.00002	.00003	.00005	.00007	.00008	.00008
9	.00000	.00000	.00001	.00003	.00006	.00012	.00018	.00020	.00022
10	.00000	.00000	.00001	.00005	.00013	.00026	.00040	.00045	.00049
11	.00000	.00000	.00002	.00010	.00026	.00052	.00077	.00086	.00086
12	.00000	.00000	.00003	.00017	.00048	.00096	.00134	.00142	.00145
13	.00000	.00001	.00006	.00031	.00081	.00154	.00203	.00210	.00218
15	.00000	.00002	.00013	.00076	.00185	.00322	.00391	.00394	.00387
17	.00001	.00003	.00027	.00156	.00344	.00556	.00623	.00608	.00587
20	.00002	.00009	.00066	.00339	.00676	.01006	.01038	.00968	.00900
25	.00007	.00027	.00177	.00772	.01401	.01896	.01789	.01567	.01387
30	.00015	.00055	.00325	.01288	.02229	.02871	.02530	.02124	.01791
40	.00043	.00130	.00653	.02309	.03803	.04685	.03785	.02925	.02269
50	.00076	.00209	.00924	.03091	.05094	.06204	.04765	.03430	.02431
70	.00147	.00345	.01328	.04032	.06665	.08359	.06176	.03971	.02366
100	.00237	.00485	.01607	.04578	.07733	.10130	.07676	.04540	.02124
200	.00369	.00638	.01731	.04583	.07904	.11470	.10730	.06121	.01663
300	.00403	.00649	.01639	.04208	.07234	.11220	.12220	.07555	.01606
500	.00396	.00607	.01440	.03557	.06237	.10140	.12840	.09562	.01841
700	.00368	.00551	.01266	.03114	.05547	.09184	.12430	.10710	.02314
1000	.00325	.00482	.01083	.02643	.04805	.08096	.11720	.11210	.03071
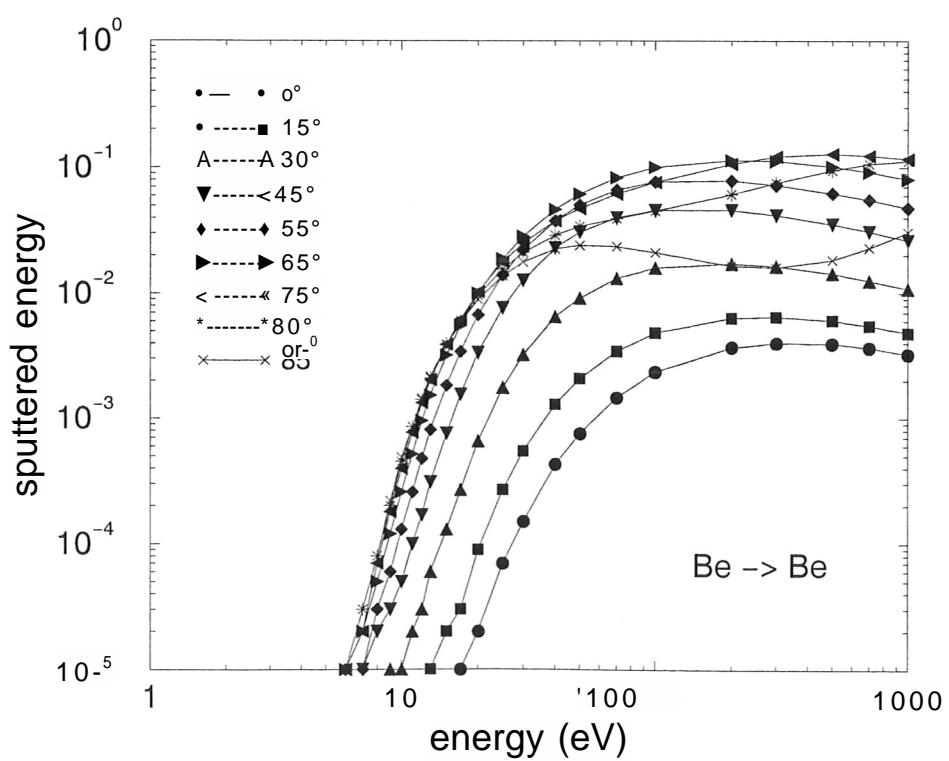
Particle reflection coefficient of Be by Be
z1= 4 , m1= 9.01 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=22, na=9

E_o (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
6	.00000	.00000	.00000	.00000	.00000	.00001	.00002	.00004	.00006
7	.00000	.00000	.00000	.00000	.00001	.00011	.00042	.00061	.00076
8	.00000	.00000	.00000	.00001	.00012	.00073	.00215	.00293	.00351
9	.00000	.00000	.00000	.00006	.00056	.00263	.00671	.00881	.01041
10	.00000	.00000	.00001	.00029	.00180	.00680	.01548	.01974	.02277
11	.00000	.00000	.00003	.00090	.00143	.01400	.02893	.03586	.04059
12	.00000	.00000	.00010	.00215	.00866	.02462	.04718	.05718	.06400
13	.00000	.00000	.00026	.00410	.01491	.03812	.06913	.08229	.09097
15	.00000	.00004	.00100	.01066	.03250	.07236	.12115	.14145	.15467
17	.00001	.00013	.00237	.01995	.05468	.11310	.18051	.20772	.22561
20	.00004	.00043	.00559	.03699	.09215	.17723	.27268	.31079	.33480
25	.00019	.00128	.01189	.06571	.15190	.27771	.41670	.47088	.50529
30	.00042	.00231	.01768	.08976	.19855	.35833	.53280	.60075	.64049
40	.00102	.00422	.02650	.11800	.25391	.45624	.67867	.75954	.80660
50	.00163	.00573	.03165	.12796	.27200	.49524	.74597	.83530	.88447
70	.00272	.00780	.03484	.12756	.27006	.50283	.78239	.88774	.94146
100	.00391	.00909	.03470	.11668	.24375	.46750	.77774	.90257	.96451
200	.00532	.00973	.02920	.08920	.18079	.36403	.69386	.88231	.97940
300	.00518	.00894	.02567	.07523	.15408	.30479	.61577	.84120	.97977
500	.00465	.00766	.02122	.06122	.12594	.25068	.50933	.75526	.97366
700	.00404	.00653	.01833	.05375	.11131	.22296	.45626	.68361	.96176
1000	.00342	.00554	.01532	.04694	.09918	.20035	.40480	.61150	.93862

Energy reflection coefficient of Be by Be
z1= 4 , m1= 9.01 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80   g/cm**3 ; ne=22, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
6	.00000	.00000	.00000	.00000	.00000	.00000	.00000	.00001	.00001
7	.00000	.00000	.00000	.00000	.00000	.00002	.00009	.00013	.00017
8	.00000	.00000	.00000	.00000	.00002	.00015	.00050	.00072	.00088
9	.00000	.00000	.00000	.00001	.00010	.00059	.00170	.00233	.00282
10	.00000	.00000	.00000	.00004	.00035	.00161	.00419	.00560	.00662
11	.00000	.00000	.00000	.00015	.00091	.00348	.00834	.01082	.01264
12	.00000	.00000	.00001	.00037	.00185	.00643	.01437	.01828	.02107
13	.00000	.00000	.00003	.00075	.00335	.01043	.02209	.02769	.03151
15	.00000	.00000	.00014	.00211	.00788	.02139	.04193	.05172	.05838
17	.00000	.00001	.00035	.00415	.01410	.03557	.06663	.08090	.09084
20	.00000	.00005	.00087	.00823	.02537	.05962	.10823	.13041	.14534
25	.00001	.00014	.00190	.01545	.04511	.10147	.18069	.21635	.24047
30	.00003	.00025	.00286	.02175	.06159	.13879	.24629	.29616	.32814
40	.00007	.00043	.00424	.02918	.08285	.19010	.34661	.41833	.46543
50	.00011	.00055	.00488	.03154	.09080	.21648	.40924	.50020	.55877
70	.00017	.00069	.00510	.03065	.09038	.22944	.46821	.59101	.67049
100	.00022	.00075	.00468	.02666	.07927	.21537	.49165	.64834	.75336
200	.00028	.00073	.00360	.01814	.05226	.15519	.44582	.67639	.84877
300	.00027	.00065	.00303	.01431	.04187	.12124	.38072	.64511	.87556
500	.00025	.00055	.00243	.01131	.03198	.09162	.29393	.56140	.88514
700	.00022	.00048	.00210	.00968	.02763	.07788	.24851	.48820	.87537
1000	.00019	.00041	.00178	.00841	.02438	.06790	.20787	.41466	.84807
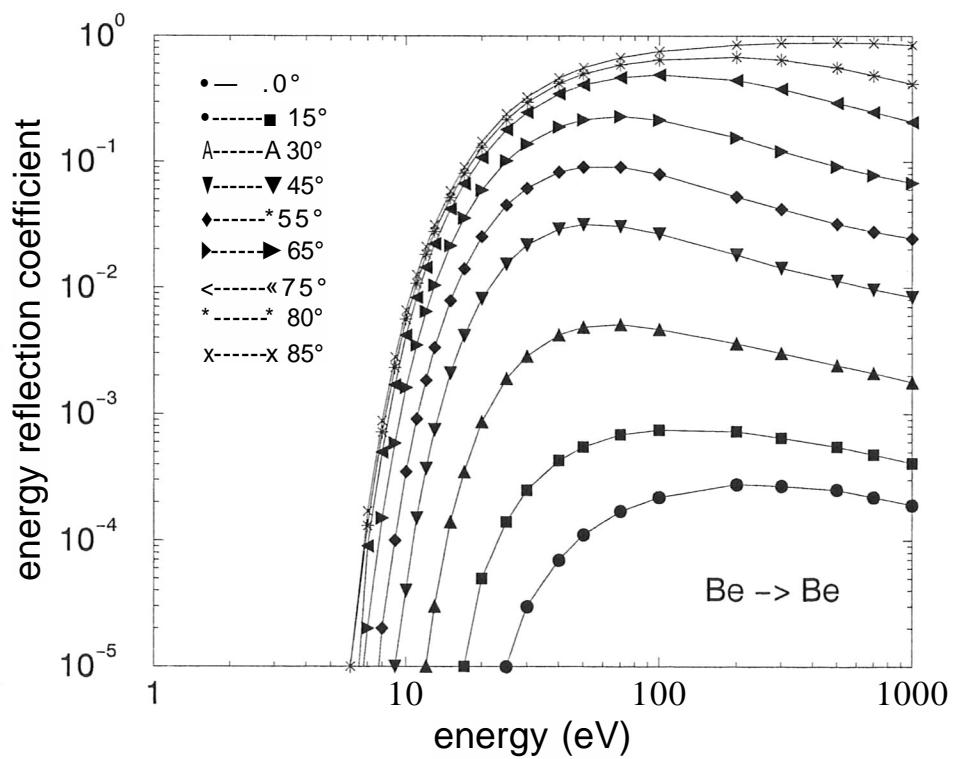
Average depth of implanted Be in Be

zl— 4 , ml= 9.01 , z2= 4 , m'2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=23, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
5	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3	0.3
6	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3
7	0.9	0.9	0.8	0.6	0.5	0.4	0.3	0.3	0.3
8	1.1	1.0	0.9	0.7	0.5	0.4	0.3	0.3	0.3
9	1.2	1.1	1.0	0.7	0.6	0.4	0.3	0.3	0.3
10	1.3	1.2	1.0	0.8	0.6	0.5	0.3	0.3	0.3
11	1.4	1.3	1.1	0.9	0.7	0.5	0.4	0.3	0.3
12	1.5	1.4	1.2	0.9	0.7	0.5	0.4	0.3	0.3
13	1.7	1.6	1.3	1.0	0.8	0.5	0.4	0.3	0.3
15	1.9	1.8	1.5	1.1	0.8	0.6	0.4	0.3	0.3
17	2.1	2.0	1.7	1.3	0.9	0.7	0.4	0.4	0.3
20	2.4	2.3	2.0	1.5	1.1	0.8	0.5	0.4	0.4
25	2.9	2.8	2.4	1.8	1.4	1.0	0.6	0.5	0.4
30	3.4	3.2	2.8	2.2	1.7	1.2	0.8	0.6	0.5
40	4.2	4.1	3.6	2.9	2.3	1.8	1.2	0.9	0.8
50	5.0	4.8	4.3	3.5	3.0	2.4	1.7	1.3	1.1
70	6.6	6.4	5.7	4.8	4.0	3.3	2.6	2.1	1.8
100	8.7	8.4	7.5	6.4	5.5	4.7	3.7	3.2	2.7
200	14.8	14.3	12.9	11.0	9.5	8.1	6.7	6.0	5.0
300	20.6	19.9	18.0	15.2	13.1	11.2	9.4	8.5	7.4
500	31.5	30.5	27.6	23.3	20.1	17.0	14.4	13.2	11.7
700	42.3	41.0	37.0	31.2	26.9	22.7	19.1	17.6	15.8
1000	58.4	56.5	51.1	43.0	36.8	30.8	25.9	23.8	21.8

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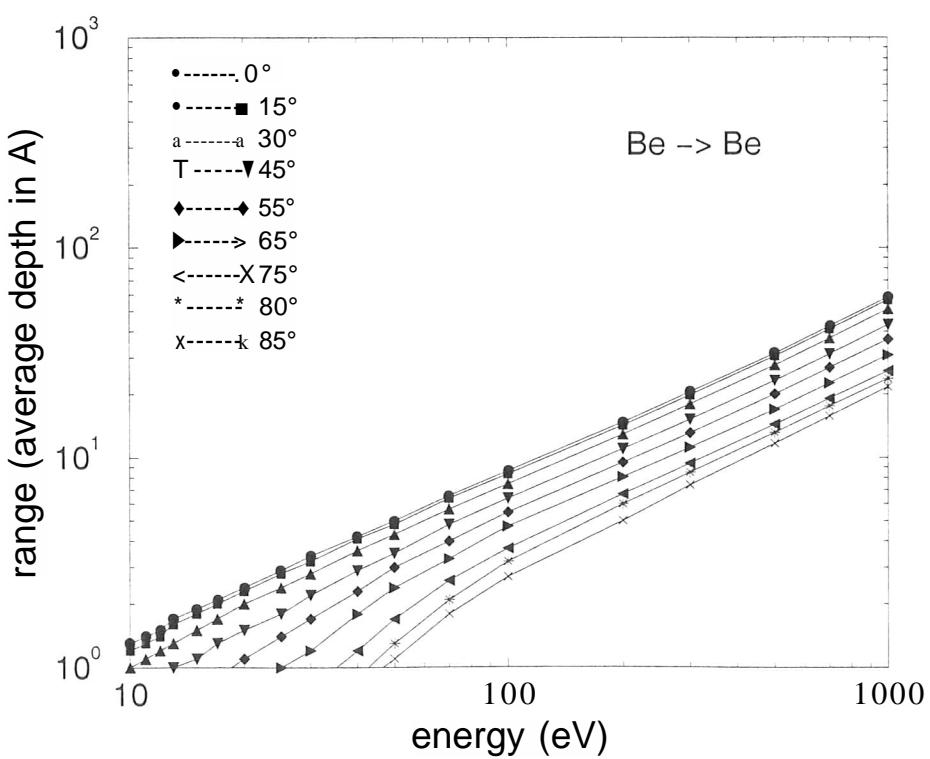
Sputter yield of Be by Ne
zl=10 , ml= 20.18 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=24, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00000	.00001	.00001	.00001	.00001	.00000	.00000
11	.00000	.00000	.00000	.00004	.00005	.00004	.00002	.00001	.00000
12	.00000	.00000	.00001	.00009	.00011	.00013	.00007	.00002	.00000
13	.00000	.00000	.00003	.00016	.00023	.00032	.00018	.00005	.00000
14	.00000	.00000	.00006	.00027	.00046	.00070	.00036	.00009	.00000
15	.00000	.00000	.00010	.00044	.00088	.00136	.00063	.00016	.00000
17	.00000	.00001	.00024	.00107	.00261	.00369	.00147	.00034	.00001
20	.00001	.00005	.00064	.00359	.00854	.01042	.00359	.00083	.00002
22	.00002	.00011	.00114	.00669	.01494	.01669	.00551	.00120	.00003
25	.00005	.00027	.00253	.01405	.02786	.02875	.00896	.00199	.00006
30	.00020	.00088	.00712	.03318	.05810	.05468	.01631	.00352	.00010
35	.00057	.00216	.01474	.06010	.09452	.08588	.02591	.00542	.00016
40	.00128	.00428	.02546	.09159	.13810	.12270	.03635	.00764	.00022
45	.00244	.00747	.03908	.12770	.18090	.16180	.04910	.01000	.00028
50	.00408	.01157	.05442	.16400	.23190	.20330	.06090	.01274	.00035
60	.00911	.02241	.08927	.24380	.33410	.28980	.09009	.01849	.00049
70	.01625	.03608	.12600	.31830	.43520	.38190	.12250	.02530	.00062
100	.04507	.08225	.22590	.51220	.70150	.65100	.22490	.04840	.00109
150	.09797	.15510	.35720	.75620	1.05700	1.06500	.44060	.10280	.00213
200	.14970	.22020	.45780	.93640	1.32700	1.42900	.68030	.17050	.00333
300	.24000	.32690	.60950	1.18200	1.71400	2.03100	1.19300	.35010	.00710
500	.37210	.47170	.79750	1.47100	2.16900	2.83200	2.18300	.83680	.02108
700	.45820	.56660	.91270	1.64200	2.43800	3.33400	3.03700	1.42600	.04593
1000	.54440	.65610	1.02100	1.79500	2.68100	3.80500	3.99600	2.33100	.11150
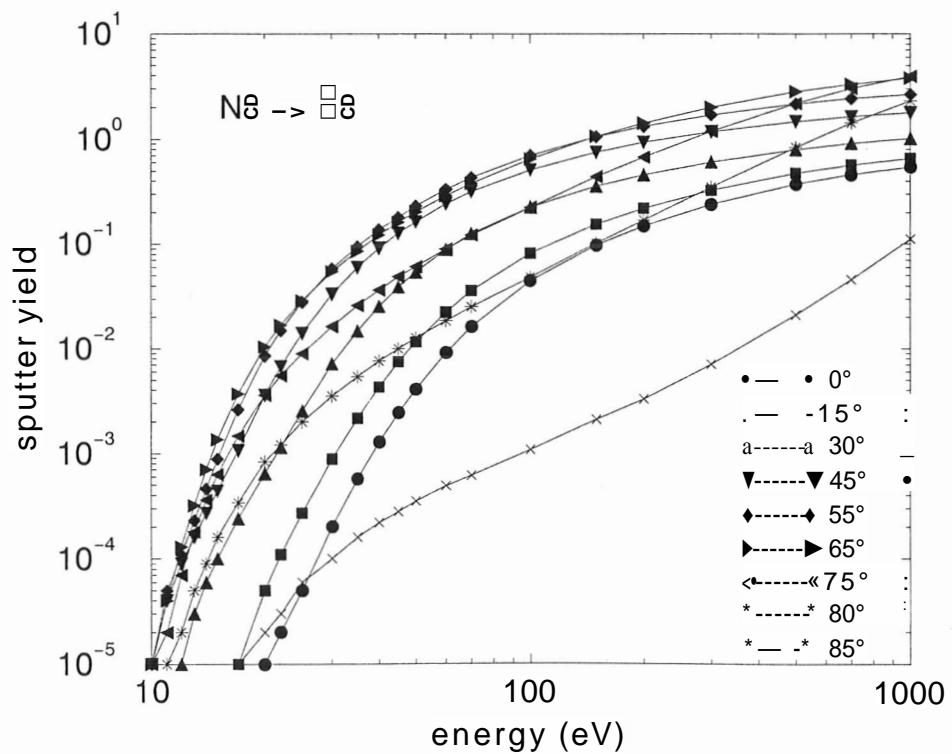
Sputtered energy of Be by Ne

zl=10 . ml= 20.18 . z2= 4 , m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=23. na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
11	.00000	.00000	.00000	.00000	.00000	.00001	.00000	.00000	.00000
12	.00000	.00000	.00000	.00001	.00001	.00002	.00001	.00000	.00000
13	.00000	.00000	.00000	.00001	.00002	.00004	.00003	.00001	.00000
14	.00000	.00000	.00000	.00002	.00005	.00010	.00006	.00002	.00000
15	.00000	.00000	.00000	.00004	.00010	.00019	.00011	.00003	.00000
17	.00000	.00000	.00001	.00010	.00032	.00056	.00026	.00006	.00000
20	.00000	.00000	.00004	.00037	.00114	.00173	.00068	.00016	.00000
22	.00000	.00000	.00007	.00072	.00208	.00287	.00108	.00023	.00001
25	.00000	.00001	.00017	.00159	.00405	.00511	.00180	.00040	.00001
30	.00001	.00004	.00054	.00391	.00869	.01010	.00337	.00070	.00002
35	.00002	.00010	.00113	.00713	.01432	.01598	.00535	.00106	.00002
40	.00005	.00021	.00196	.01087	.02094	.02276	.00757	.00148	.00003
45	.00009	.00036	.00298	.01507	.02725	.02995	.00996	.00187	.00004
50	.00014	.00055	.00408	.01881	.03426	.03715	.01224	.00235	.00004
60	.00031	.00103	.00637	.02685	.04736	.05095	.01753	.00330	.00005
70	.00053	.00158	.00864	.03349	.05875	.06468	.02295	.00429	.00006
100	.00132	.00317	.01346	.04652	.08226	.09574	.03811	.00722	.00009
150	.00253	.00516	.01776	.05564	.09963	.12790	.06429	.01346	.00013
200	.00347	.00648	.01973	.05862	.10430	.14440	.08678	.02043	.00019
300	.00467	.00795	.02150	.05884	.10500	.15770	.12290	.03664	.00034
500	.00569	.00889	.02179	.05559	.09887	.15950	.16250	.07051	.00092
700	.00596	.00906	.02112	.05233	.09314	.15300	.18200	.09987	.00196
1000	.00597	.00885	.02003	.04859	.08653	.14460	.19020	.13290	.00485
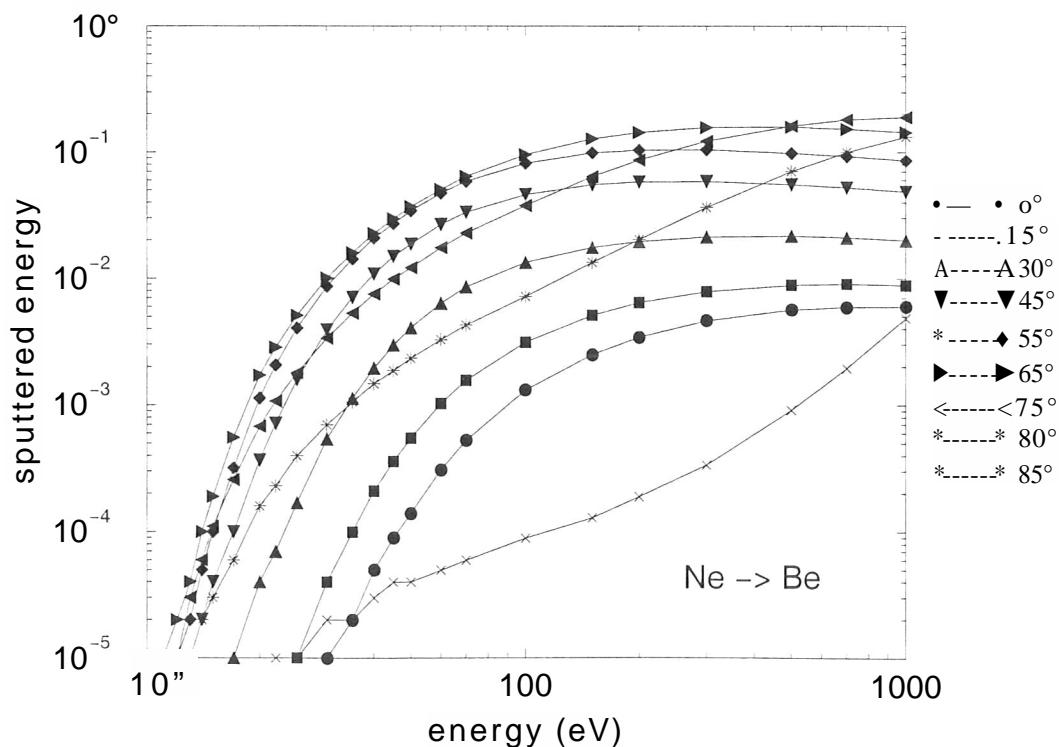
30

Particle reflection coefficient of Ne by Be
zl=10 , ml= 20.18 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=24, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00281	.01013	.05765	.26236	.52304	.80910	.97362	.99671	.99999
11	.00216	.00846	.05284	.25464	.51755	.80784	.97405	.99686	.99998
12	.00164	.00708	.04879	.24751	.51242	.80651	.97442	.99697	.99999
13	.00128	.00597	.04537	.24138	.50766	.80508	.97475	.99708	.99999
14	.00100	.00511	.04251	.23568	.50342	.80365	.97501	.99716	.99999
15	.00080	.00438	.04011	.23070	.49887	.80224	.97521	.99724	.99999
17	.00052	.00338	.03623	.22213	.49135	.79911	.97549	.99736	.99999
20	.00029	.00248	.03205	.21112	.48031	.79441	.97563	.99749	.99999
22	.00021	.00208	.02991	.20504	.47390	.79083	.97541	.99759	.99999
25	.00014	.00169	.02710	.19581	.46418	.78498	.97545	.99761	.99999
30	.00009	.00134	.02366	.18361	.44771	.77529	.97505	.99771	.99999
35	.00007	.00114	.02101	.17147	.43233	.76401	.97330	.99769	.99999
40	.00006	.00103	.01896	.16197	.41503	.75168	.97248	.99766	1.00000
45	.00006	.00087	.01714	.15043	.40257	.74063	.97048	.99762	1.00000
50	.00005	.00082	.01566	.14120	.38706	.72899	.96893	.99744	1.00000
60	.00004	.00065	.01316	.12547	.35870	.70518	.96426	.99720	1.00000
70	.00004	.00057	.01129	.11145	.33283	.68138	.95920	.99688	1.00000
100	.00002	.00038	.00760	.08291	.27126	.61068	.94230	.99557	.99999
150	.00002	.00027	.00522	.05686	.20194	.51747	.90741	.99173	.99999
200	.00002	.00022	.00379	.04353	.15976	.44514	.86828	.98612	.99998
300	.00001	.00018	.00297	.03132	.11416	.34529	.78636	.96938	.99997
500	.00001	.00015	.00217	.02192	.07806	.24256	.65276	.91848	.99978
700	.00001	.00013	.00181	.01737	.06316	.20049	.55458	.85894	.99930
1000	.00001	.00013	.00152	.01385	.05134	.16131	.46435	.76890	.99738

31
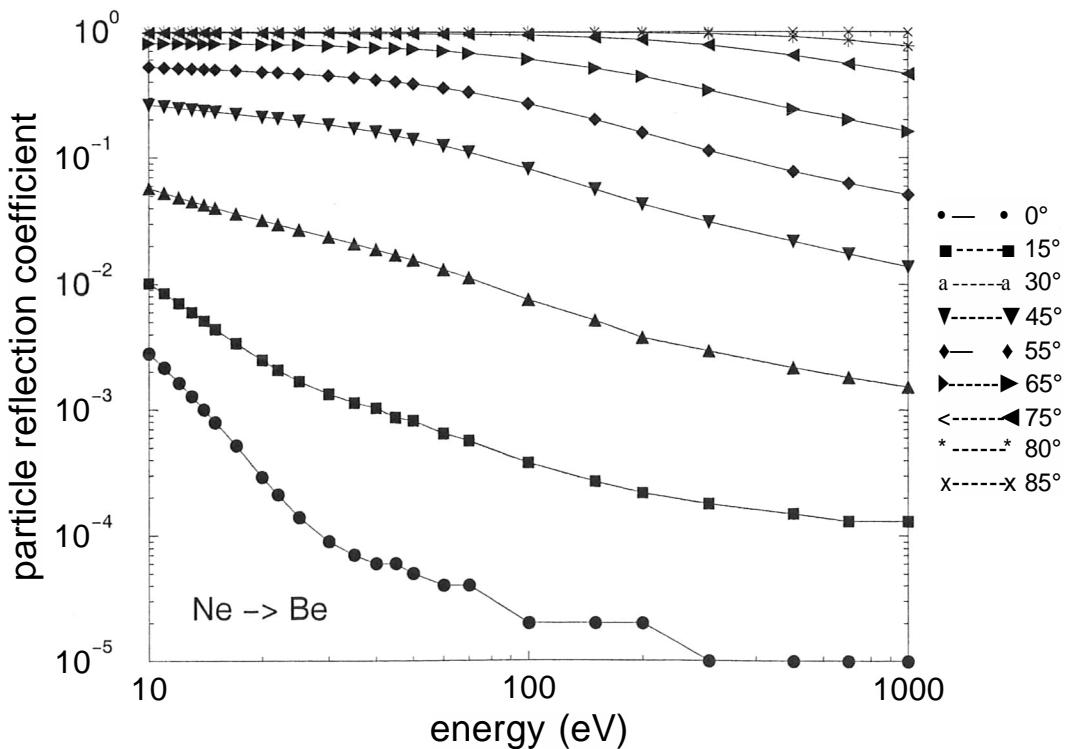
Energy reflection coefficient of Ne by Be
zl=10 . ml= 20.18 , z2= 4 . m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=24. na=9

Eq(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00001	.00081	.01458	.06570	.21055	.48181	.64848	.79922
11	.00000	.00002	.00086	.01532	.06807	.21594	.49107	.65710	.80862
12	.00000	.00002	.00091	.01595	.07099	.22079	.49950	.66518	.81703
13	.00000	.00002	.00095	.01649	.07191	.22509	.50704	.67274	.82458
14	.00000	.00002	.00098	.01691	.07348	.22892	.51392	.67968	.83134
15	.00000	.00002	.00100	.01729	.07484	.23234	.52028	.68617	.83743
17	.00000	.00003	.00104	.01782	.07706	.23831	.53115	.69786	.84813
20	.00000	.00003	.00107	.01828	.07933	.24512	.54455	.71255	.86114
22	.00000	.00003	.00108	.01845	.08013	.24796	.55174	.72096	.86825
25	.00000	.00003	.00107	.01837	.08109	.25192	.56097	.73146	.87721
30	.00000	.00003	.00101	.01811	.08110	.25515	.57306	.74571	.88867
35	.00000	.00002	.00094	.01741	.07995	.25667	.58075	.75646	.89717
40	.00000	.00002	.00087	.01663	.07819	.25487	.58689	.76487	.90412
45	.00000	.00002	.00077	.01570	.07672	.25392	.59066	.77176	.90997
50	.00000	.00002	.00071	.01492	.07431	.25192	.59403	.77686	.91494
60	.00000	.00001	.00058	.01308	.06922	.24567	.59651	.78513	.92276
70	.00000	.00001	.00048	.01159	.06406	.23815	.59460	.79032	.92862
100	.00000	.00001	.00029	.00820	.05136	.21245	.58748	.79894	.93949
150	.00000	.00000	.00017	.00511	.03509	.17452	.55686	.79609	.94792
200	.00000	.00000	.00012	.00353	.02658	.14450	.52283	.78663	.95192
300	.00000	.00000	.00008	.00227	.01705	.10394	.45481	.75831	.95467
500	.00000	.00000	.00006	.00144	.01006	.06354	.35050	.68904	.95324
700	.00000	.00000	.00005	.00110	.00762	.04853	.21i14	.61941	.94902
1000	.00000	.00000	.00004	.00086	.00585	.03619	.21592	.52761	.93878

Ne -> Be

Legend:
•— • o°
■----■ 15°
A----A 30°
▼----▼ 45°
♦----♦ 55°
▶----▶ 65°
<-----≪ 75°
----- 80°
×— 85°

x-axis: energy (eV)
y-axis: energy reflection coefficient
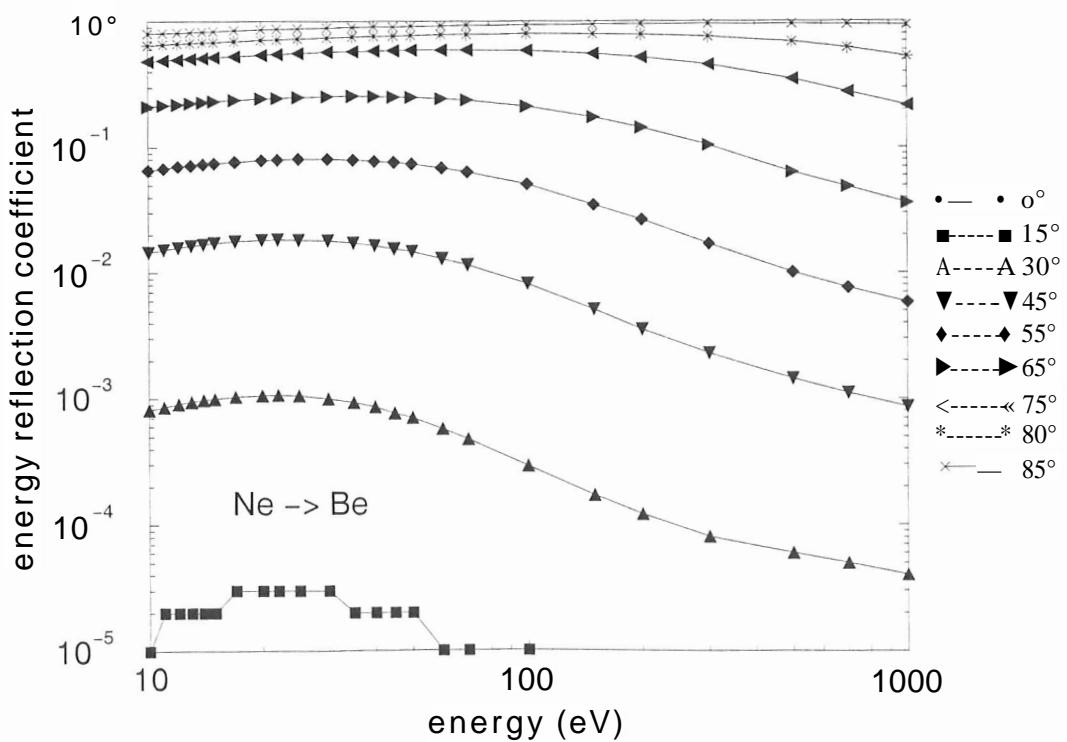
Average depth of implanted Ne in Be
zl=10 , ml= 20.18 , z2= 4 , m2= 9.01 , Es=3.38 , rho=1.80 g/cm**3 ; ne=24, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2
11	1.0	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.1
12	1.1	1.0	0.9	0.8	0.7	0.6	0.4	0.3	0.1
13	1.2	1.1	1.0	0.8	0.7	0.6	0.4	0.3	0.2
14	1.3	1.2	1.0	0.9	0.8	0.6	0.5	0.3	0.2
15	1.4	1.3	1.1	0.9	0.8	0.7	0.5	0.4	0.2
17	1.5	1.5	1.3	1.0	0.9	0.7	0.5	0.4	0.2
20	1.8	1.7	1.5	1.2	1.0	0.8	0.6	0.4	0.2
22	2.0	1.9	1.6	1.3	1.1	0.9	0.6	0.5	0.2
25	2.2	2.1	1.8	1.4	1.2	1.0	0.7	0.5	0.3
30	2.6	2.5	2.1	1.7	1.4	1.1	0.8	0.6	0.4
35	3.0	2.8	2.5	1.9	1.6	1.3	0.9	0.7	0.4
40	3.3	3.2	2.7	2.2	1.8	1.4	1.0	0.8	0.6
45	3.7	3.5	3.0	2.4	2.0	1.6	1.1	0.9	0.5
50	4.0	3.8	3.3	2.6	2.1	1.7	1.3	1.0	0.5
60	4.6	4.4	3.8	3.0	2.5	2.0	1.5	1.2	0.8
70	5.1	4.9	4.3	3.4	2.8	2.2	1.7	1.3	0.9
100	6.7	6.4	5.6	4.4	3.6	2.9	2.3	1.8	1.3
150	8.8	8.5	7.4	5.9	4.9	4.0	3.1	2.6	1.8
200	10.7	10.3	9.1	7.3	6.0	4.9	3.9	3.2	2.3
300	14.1	13.6	12.0	9.7	8.0	6.4	5.1	4.4	3.5
500	20.1	19.4	17.2	14.0	11.5	9.3	7.4	6.6	5.1
700	25.5	24.6	21.9	17.8	14.7	11.8	9.3	8.3	7.0
1000	33.1	32.0	28.5	23.2	19.2	15.3	12.1	10.9	9.0
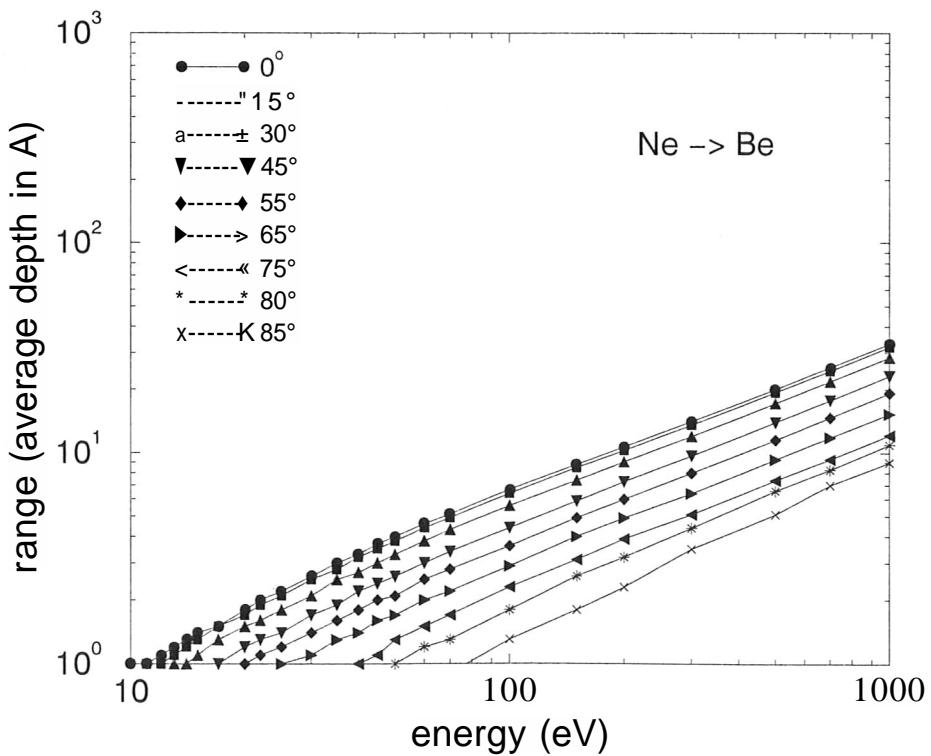
Sputter yield of Be by Ar

zl=18 , ml= 39.95 , z2= 4 , m2= 9.01 . Es=3.38 , rho=1.80 g/cm**3 ; ne=21, na-9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
15	.00000	.00000	.00000	.00002	.00003	.00003	.00002	.00000	.00000
16	.00000	.00000	.00000	.00005	.00007	.00007	.00004	.00001	.00000
17	.00000	.00000	.00001	.00009	.00012	.00015	.00010	.00003	.00000
18	.00000	.00000	.00002	.00014	.00021	.00029	.00019	.00005	.00000
20	.00000	.00000	.00005	.00029	.00052	.00089	.00056	.00014	.00000
22	.00000	.00000	.00012	.00055	.00123	.00225	.00121	.00030	.00001
25	.00000	.00002	.00027	.00140	.00345	.00631	.00302	.00070	.00002
30	.00001	.00008	.00083	.00509	.01252	.01908	.00809	.00184	.00005
35	.00005	.00025	.00224	.01256	.02914	.03990	.01593	.00350	.00010
40	.00015	.00063	.00494	.02481	.05334	.06713	.02628	.00589	.00018
45	.00034	.00130	.00896	.04118	.08221	.10140	.03825	.00857	.00027
50	.00070	.00236	.01442	.06115	.11750	.13800	.05280	.01177	.00035
60	.00202	.00580	.02993	.11020	.19530	.22540	.08645	.01895	.00057
70	.00436	.01134	.04993	.16380	.28230	.32190	.12390	.02823	.00083
100	.01830	.03792	.12370	.32930	.54360	.63020	.25930	.05832	.00172
150	.05720	.09762	.24500	.56450	.91330	1.12100	.52270	.12780	.00362
200	.10090	.15850	.35070	.75550	1.20000	1.54200	.81080	.21450	.00601
300	.19060	.26890	.52780	1.05100	1.64300	2.22400	1.39800	.42290	.01227
500	.34860	.44940	.78640	1.46400	2.24300	3.21400	2.58100	.95070	.03306
700	.47070	.58740	.96780	1.74200	2.65200	3.93300	3.64500	1.60300	.06518
1000	.60740	.73620	1.16200	2.02700	3.06600	4.65100	5.00500	2.64100	.13550

34
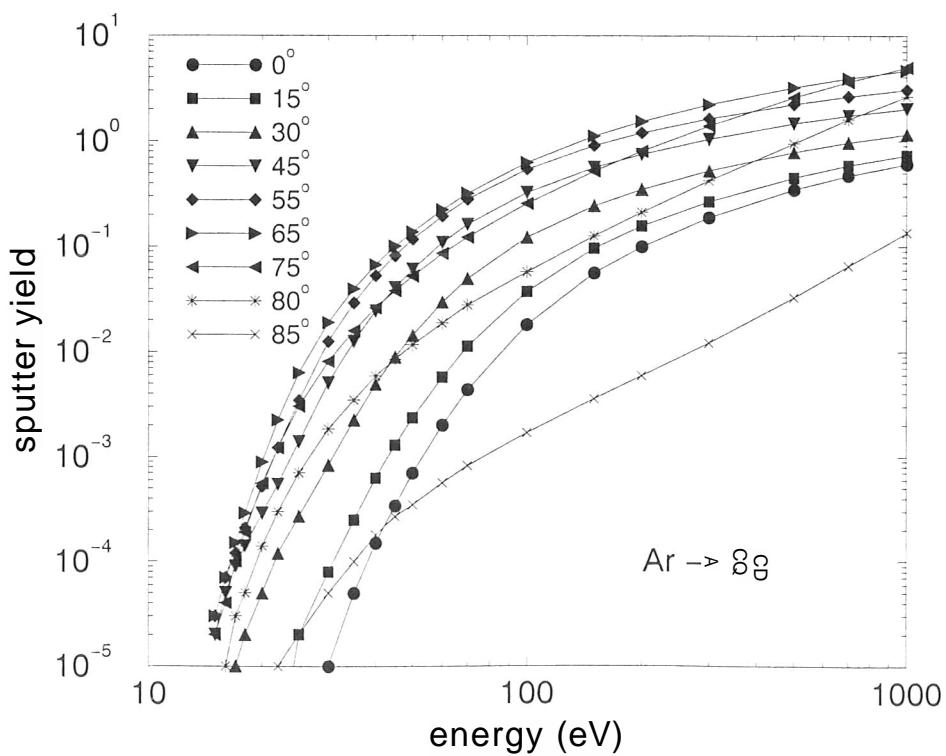
Sputtered energy of Be by Ar

z1=18 , m1= 39.95 , z2= 4 , m2= 9.01 , Es—3.38 , rho=1.80 g/cm**3 ; ne=20, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
16	.00000	.00000	.00000	.00000	.00000	.00001	.00000	.00000	.00000
17	.00000	.00000	.00000	.00000	.00001	.00001	.00001	.00000	.00000
18	.00000	.00000	.00000	.00001	.00001	.00002	.00002	.00001	.00000
20	.00000	.00000	.00000	.00002	.00004	.00008	.00006	.00002	.00000
22	.00000	.00000	.00000	.00003	.00009	.00022	.00014	.00004	.00000
25	.00000	.00000	.00001	.00009	.00030	.00065	.00037	.00009	.00000
30	.00000	.00000	.00004	.00036	.00114	.00212	.00106	.00024	.00001
35	.00000	.00001	.00011	.00094	.00276	.00466	.00213	.00046	.00001
40	.00000	.00002	.00025	.00193	.00518	.00802	.00360	.00077	.00002
45	.00001	.00004	.00046	.00323	.00807	.01224	.00521	.00112	.00003
50	.00002	.00008	.00075	.00483	.01147	.01666	.00721	.00151	.00003
60	.00005	.00020	.00156	.00863	.01902	.02712	.01170	.00242	.00005
70	.00011	.00038	.00255	.01247	.02693	.03806	.01647	.00347	.00007
100	.00043	.00117	.00580	.02286	.04742	.06890	.03241	.00658	.00011
150	.00119	.00268	.01002	.03375	.06834	.10540	.05841	.01266	.00019
200	.00192	.00391	.01279	.03957	.07788	.12690	.08118	.01963	.00026
300	.00309	.00549	.01586	.04480	.08478	.14630	.11840	.03416	.00042
500	.00448	.00727	.01822	.04713	.08639	.15370	.16730	.06551	.00097
700	.00521	.00794	.01897	.04708	.08502	.15250	.19220	.09604	.00180
1000	.00558	.00831	.01907	.04610	.08237	.14770	.20930	.13110	.00389
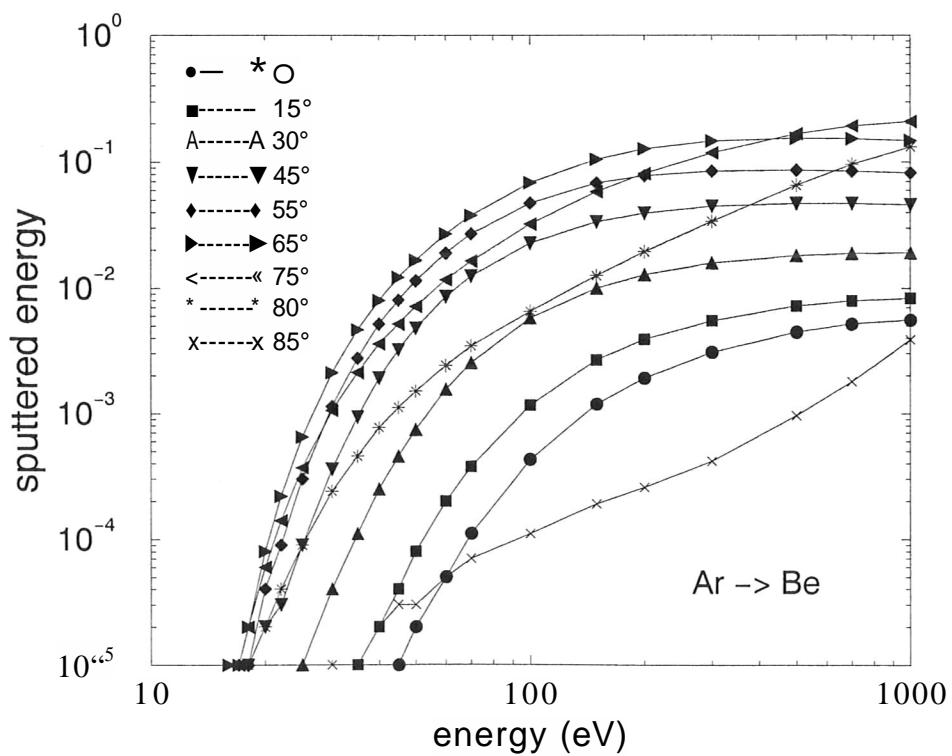
Particle reflection coefficient of Ar by Be
z1=18 , m1= 39.95 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=22, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00100	.04729	.25508	.67790	.96666	.99715	1.00000
15	.00000	.00000	.00057	.04205	.25258	.68545	.97043	.99780	1.00000
16	.00000	.00000	.00052	.04152	.25199	.68611	.97098	.9978i	1.00000
17	.00000	.00000	.00050	.04101	.25147	.68673	.97139	.99795	1.00000
18	.00000	.00000	.00048	.04060	.25084	.68683	.97174	.99801	1.00000
20	.00000	.00000	.00046	.03985	.24933	.68690	.97233	.99810	1.00000
22	.00000	.00000	.00046	.03911	.24752	.68585	.97250	.99818	1.00000
25	.00000	.00000	.00044	.03806	.24429	.68321	.97284	.99825	1.00000
30	.00000	.00000	.00043	.03620	.23771	.67676	.97259	.99832	1.00000
35	.00000	.00000	.00040	.03394	.22901	.66778	.97183	.99832	1.00000
40	.00000	.00000	.00037	.03188	.21997	.65920	.97081	.99830	1.00000
45	.00000	.00000	.00036	.02988	.21190	.64773	.96985	.99824	1.00000
50	.00000	.00000	.00031	.02782	.20235	.63735	.96793	.99806	1.00000
60	.00000	.00000	.00025	.02366	.18489	.61382	.96435	.99803	1.00000
70	.00000	.00000	.00021	.02046	.16845	.59265	.96093	.99764	1.00000
100	.00000	.00000	.00013	.01355	.12884	.52730	.94567	.99686	1.00000
150	.00000	.00000	.00008	.00810	.08627	.43028	.91589	.99441	1.00000
200	.00000	.00000	.00006	.00564	.06254	.35762	.88080	.99027	.99999
300	.00000	.00000	.00004	.00356	.03990	.26148	.81078	.98040	.99999
500	.00000	.00000	.00003	.00239	.02390	.16710	.67312	.94469	.99994
700	.00000	.00000	.00002	.00188	.01834	.12437	.57108	.89780	.99982
1000	.00000	.00000	.00002	.00148	.01404	.09565	.46523	.82344	.99904
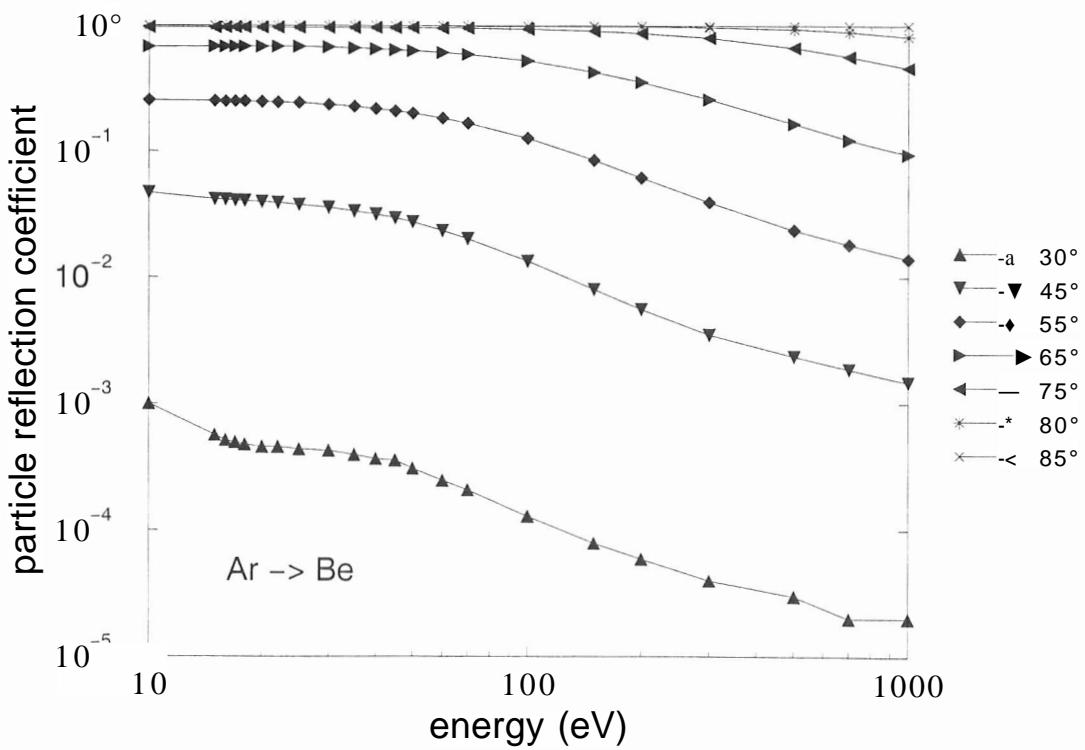
Energy reflection coefficient of Ar by Be
z1=18 , m1= 39.95 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=22, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00000	.00091	.01440	.10330	.37269	.56379	.76477
15	.00000	.00000	.00000	.00118	.01707	.11652	.40411	.60051	.79551
16	.00000	.00000	.00000	.00121	.01742	.11838	.40897	.60619	.80022
17	.00000	.00000	.00001	.00124	.01772	.12010	.41353	.61151	.80456
18	.00000	.00000	.00001	.00126	.01798	.12162	.41775	.61649	.80856
20	.00000	.00000	.00001	.00130	.01840	.12428	.42535	.62544	.81582
22	.00000	.00000	.00001	.00131	.01868	.12639	.43212	.63340	.82217
25	.00000	.00000	.00001	.00133	.01897	.12884	.44059	.64376	.83024
30	.00000	.00000	.00001	.00130	.01902	.13146	.45198	.65803	.84123
35	.00000	.00000	.00001	.00125	.01881	.13260	.46051	.66918	.85065
40	.00000	.00000	.00001	.00119	.01828	.13298	.46684	.67847	.85876
45	.00000	.00000	.00001	.00113	.01774	.13289	.47241	.68636	.86569
50	.00000	.00000	.00000	.00104	.01716	.13146	.47608	.69298	.87172
60	.00000	.00000	.00000	.00087	.01572	.12838	.48096	.70333	.88152
70	.00000	.00000	.00000	.00074	.01442	.12489	.48404	.71034	.88913
100	.00000	.00000	.00000	.00046	.01085	.11207	.48095	.72432	.90430
150	.00000	.00000	.00000	.00023	.00683	.08952	.46505	.72990	.91768
200	.00000	.00000	.00000	.00014	.00453	.07184	.43968	.72598	.92464
300	.00000	.00000	.00000	.00007	.002.38	.04841	.39262	.71011	.93120
500	.00000	.00000	.00000	.00004	.00110	.02585	.30244	.65920	.93387
700	.00000	.00000	.00000	.00003	.00075	.01640	.24079	.60217	.93188
1000	.00000	.00000	.00000	.00002	.00053	.01135	.17950	.52483	.92535
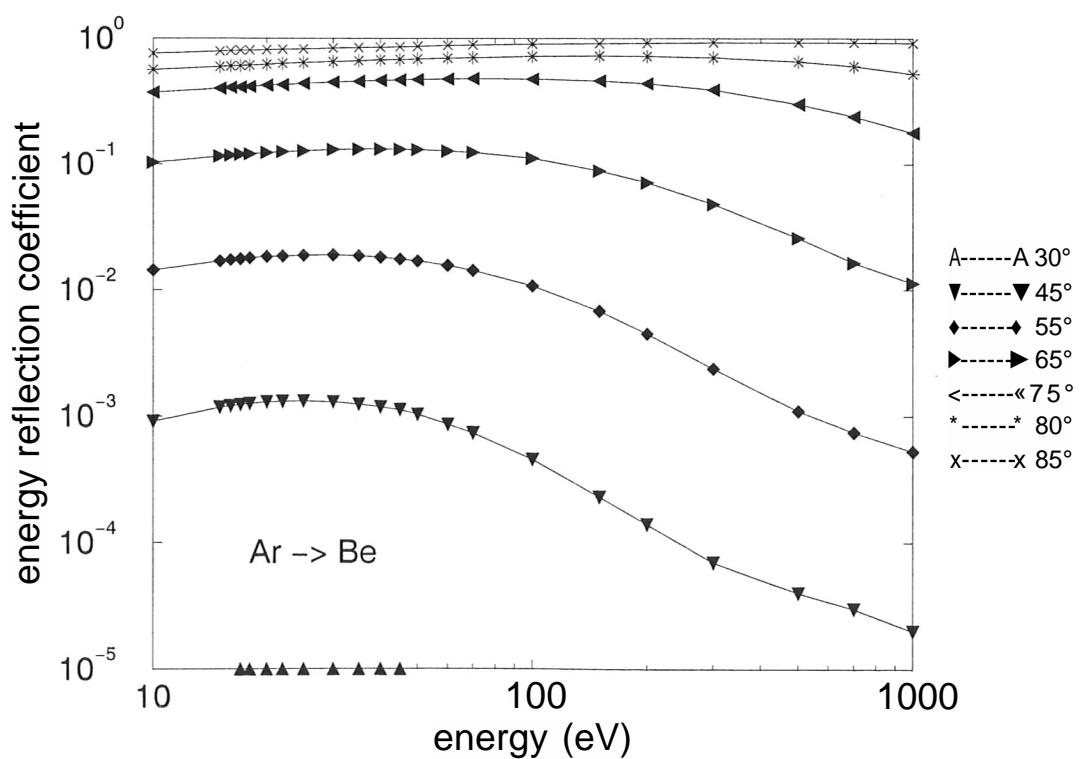
Average depth of implanted Ar in Be

z1=18 , m1= 39.95 , z2= 4 , m2= 9.01 , Es=3.38   , rho=1.80 g/cm**3 ; ne=22, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	1.3	1.3	1.2	1.0	0.8	0.6	0.5	0.4	0.2
15	2.1	2.0	1.8	1.3	1.1	0.8	0.6	0.5	0.4
16	2.3	1.9	1.8	1.4	1.1	0.9	0.7	0.5	0.2
17	2.4	2.0	2.0	1.5	1.2	0.9	0.7	0.5	0.2
18	2.5	2.4	2.1	1.6	1.2	0.9	0.7	0.6	0.3
20	2.7	2.6	2.2	1.7	1.3	1.0	0.8	0.6	0.4
22	2.9	2.8	2.4	1.8	1.4	1.1	0.8	0.6	0.4
25	3.3	3.1	2.7	2.0	1.5	1.2	0.9	0.7	0.6
30	3.7	3.6	3.1	2.3	1.8	1.3	1.0	0.8	0.6
35	4.2	4.0	3.5	2.6	2.0	1.5	1.1	1.0	0.6
40	4.6	4.4	3.8	2.8	2.2	1.6	1.2	1.1	0.8
45	5.0	4.8	4.1	3.1	2.4	1.8	1.3	1.1	0.7
50	5.3	5.1	4.4	3.3	2.5	1.9	1.5	1.2	1.1
60	6.0	5.7	5.0	3.7	2.9	2.2	1.7	1.4	1.0
70	6.6	6.3	5.5	4.2	3.2	2.4	1.8	1.6	1.1
100	8.2	7.9	6.9	5.3	4.0	3.1	2.3	1.9	1.4
150	10.4	10.0	8.8	6.8	5.3	4.0	3.0	2.6	1.4
200	12.3	11.9	10.4	8.1	6.3	4.7	3.6	3.1	2.8
300	15.6	15.0	13.3	10.5	8.2	6.1	4.7	4.0	4.2
500	21.1	20.3	18.0	14.3	11.3	8.4	6.4	5.6	4.4
700	25.7	24.8	22.0	17.6	14.0	10.4	7.7	6.8	6.0
1000	31.9	30.7	27.4	22.0	17.6	13.1	9.7	8.5	7.1
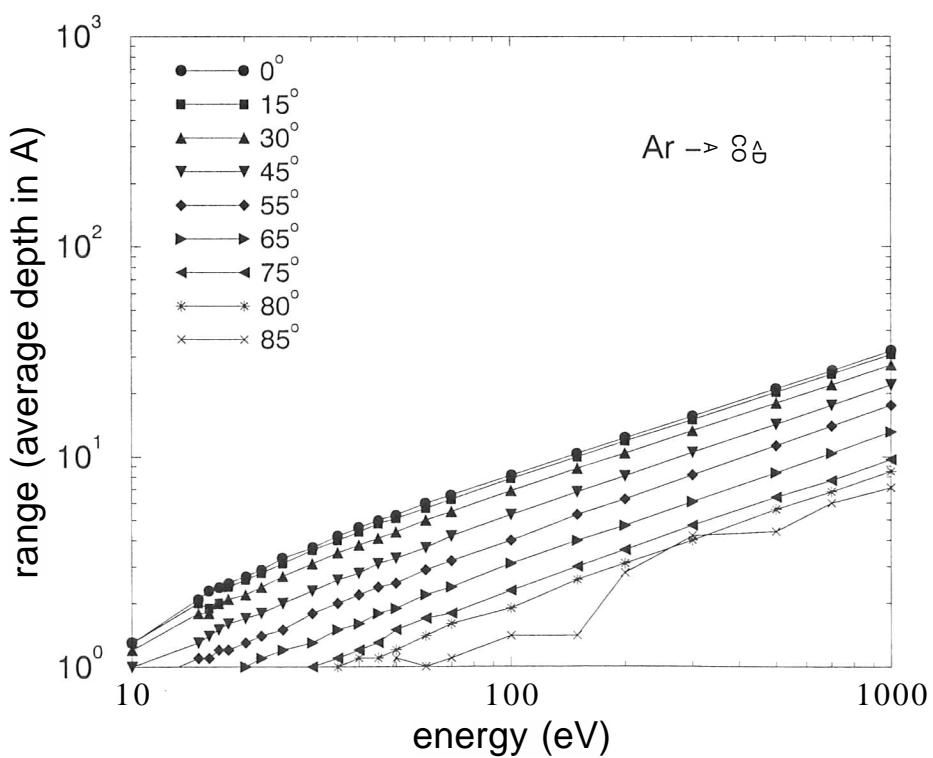
Sputter yield of C by H

z1= 1 , m1= 1.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85   g/cm**3 ; ne= 9, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
40	.00001	.00001	.00002	.00003	.00003	.00001	.00000	.00000	.00000
50	.00025	.00027	.00034	.00039	.00038	.00021	.00005	.00001	.00000
70	.00123	.00135	.00166	.00210	.00239	.00236	.00132	.00052	.00009
100	.00292	.00298	.00393	.00519	.00696	.00920	.00858	.00474	.00067
140	.00442	.00488	.00640	.00876	.01358	.01977	.02465	.01681	.00241
200	.00584	.00635	.00834	.01307	.01935	.03042	.04663	.03874	.00634
300	.00705	.00758	.01041	.01664	.02584	.04311	.06948	.06985	.01517
500	.00676	.00754	.01075	.01887	.02912	.04936	.08726	.10260	.03862
1000	.00568	.00650	.01002	.01875	.02933	.04875	.09062	.11960	.09054
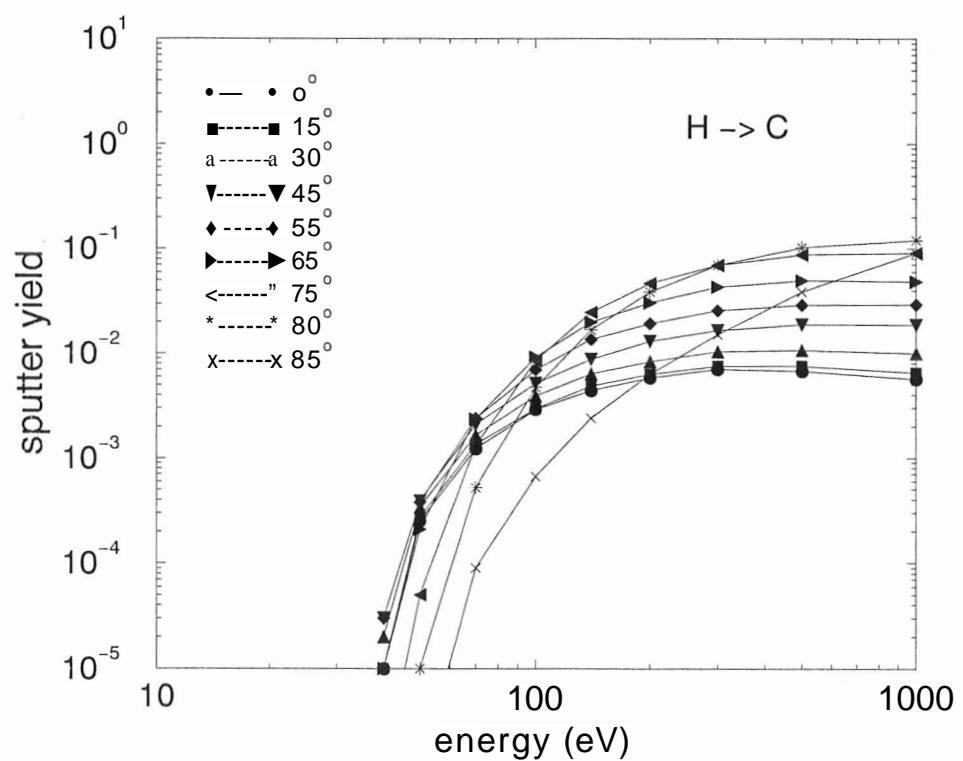
Sputtered energy of C by H

zl= 1 , ml= 1.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne= 8, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
50	.00001	.00001	.00001	.00001	.00001	.00001	.00000	.00000	.00000
70	.00005	.00006	.00007	.00010	.00012	.00012	.00007	.00003	.00000
100	.00013	.00013	.00019	.00026	.00036	.00051	.00052	.00032	.00005
140	.00019	.00022	.00029	.00041	.00067	.00107	.00151	.00120	.00019
200	.00024	.00027	.00035	.00057	.00090	.00150	.00273	.00256	.00050
300	.00026	.00027	.00040	.00065	.00103	.00186	.00346	.00391	.00108
500	.00018	.00021	.00030	.00057	.00094	.00172	.00334	.00448	.00204
1000	.00010	.00012	.00019	.00039	.00067	.00118	.00243	.00345	.00318
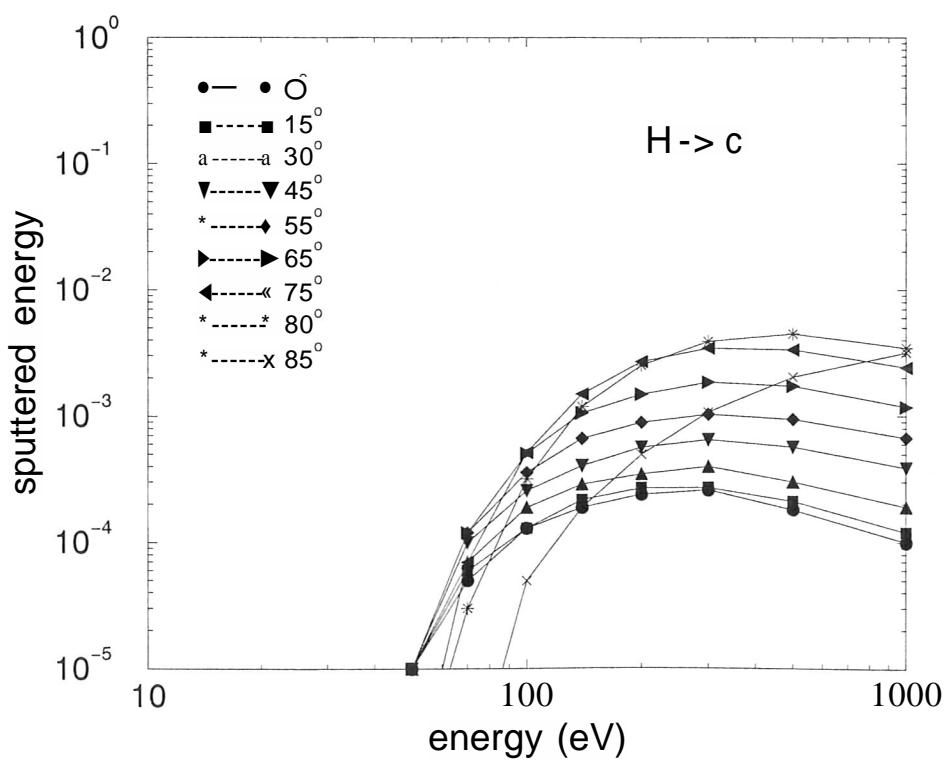
Particle reflection coefficient of H by C
z1= 1 , m1= 1.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=11, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.47922	.50189	.56210	.67137	.76475	.86145	.93951	.96175	.97364
20	.40703	.42691	.48170	.58510	.68816	.81375	.93353	.96975	.98641
40	.35801	.37397	.41126	.49948	.59262	.76059	.89885	.96301	.99171
50	.33854	.35378	.40164	.47559	.56412	.72666	.90618	.97156	.99550
70	.30533	.31954	.36260	.44190	.52493	.64735	.84133	.94446	.99301
100	.27915	.29247	.33333	.41212	.48557	.60155	.79212	.92009	.99218
140	.25339	.26573	.30785	.38205	.45584	.55925	.74225	.88567	.99024
200	.22589	.23769	.27818	.35000	.42377	.52524	.68809	.83811	.98510
300	.19400	.20504	.24447	.31666	.38824	.48341	.63439	.77505	.97262
500	.15306	.16254	.20067	.27101	.34320	.43558	.57278	.69748	.93523
1000	.09807	.10772	.13893	.20347	.27481	.37222	.51010	.61673	.84072
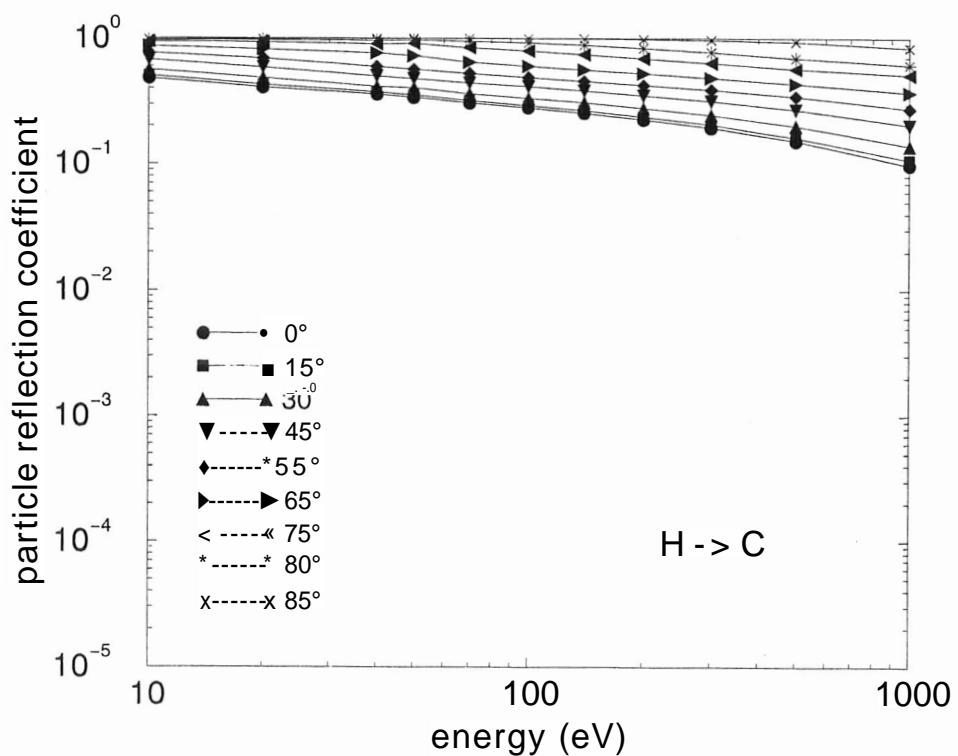
Energy reflection coefficient of H by 0
zl= 1 , ml= 1.01 , z2= 6 . m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=ll, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.24399	.26364	.31866	.42924	.53543	.65904	.77661	.81639	.83987
20	.19812	.21350	.25936	.35767	.46998	.62579	.80065	.86527	.89941
40	.16703	.17870	.20779	.28394	.37717	.57292	.76870	.87451	.92994
50	.15499	.16579	.20166	.26395	.34964	.53526	.78243	.89217	.94288
70	.13475	.14405	.17421	.23715	.31274	.44564	.69829	.85428	.94159
100	.11997	.12812	.15530	.21297	.27802	.39555	.63612	.82220	.94436
140	.10526	.11283	.13917	.19156	.25154	.35297	.57240	.77559	.94385
200	.09068	.09753	.12149	.16905	.22504	.31775	.50597	.71195	.93794
300	.07425	.08017	.10238	.14526	.19681	.27840	.44158	.62590	.91940
500	.05480	.05949	.07772	.11561	.16276	.23432	.37070	.52425	.86385
1000	.03144	.03536	.04766	.07687	.11503	.17866	.29964	.41380	.72093
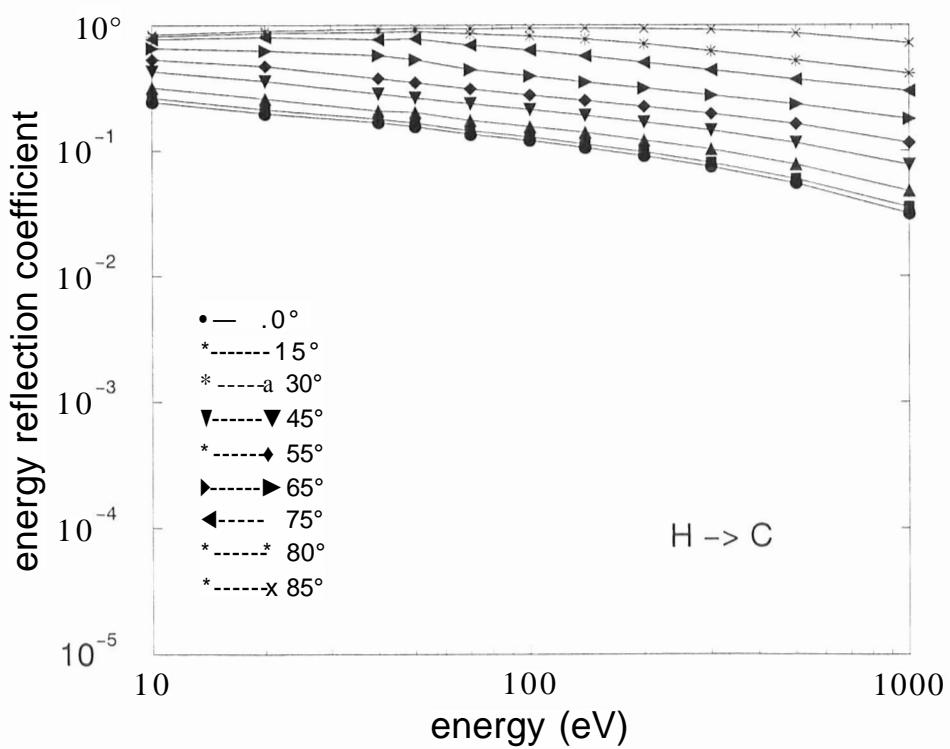
Average depth of implanted H in C

zl= 1 , ml= 1.01 , z2—6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; n e=11, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	6.3	6.3	6.1	6.0	5.9	5.7	5.5	5.5	5.4
20	10.2	10.1	9.9	9.5	9.3	9.1	8.8	8.7	8.6
40	16.8	16.6	16.1	15.5	15.0	14.6	14.2	14.1	13.8
50	19.8	19.6	19.0	18.2	17.6	17.1	16.6	16.2	16.1
70	25.5	25.2	24.4	23.4	22.6	21.8	21.1	20.9	20.5
100	33.7	33.2	32.1	30.6	29.5	28.3	27.3	27.2	26.5
140	43.9	43.4	41.8	39.6	37.9	36.5	35.3	34.9	34.5
200	58.9	58.0	55.9	52.4	50.3	48.1	46.2	45.5	45.5
300	82.3	81.1	77.8	73.0	69.0	65.7	63.0	62.0	61.2
500	127.4	125.2	119.2	110.1	103.7	97.8	92.3	90.6	90.9
1000	233.5	228.4	215.0	194.7	ISO.7	167.3	155.6	150.5	150.1
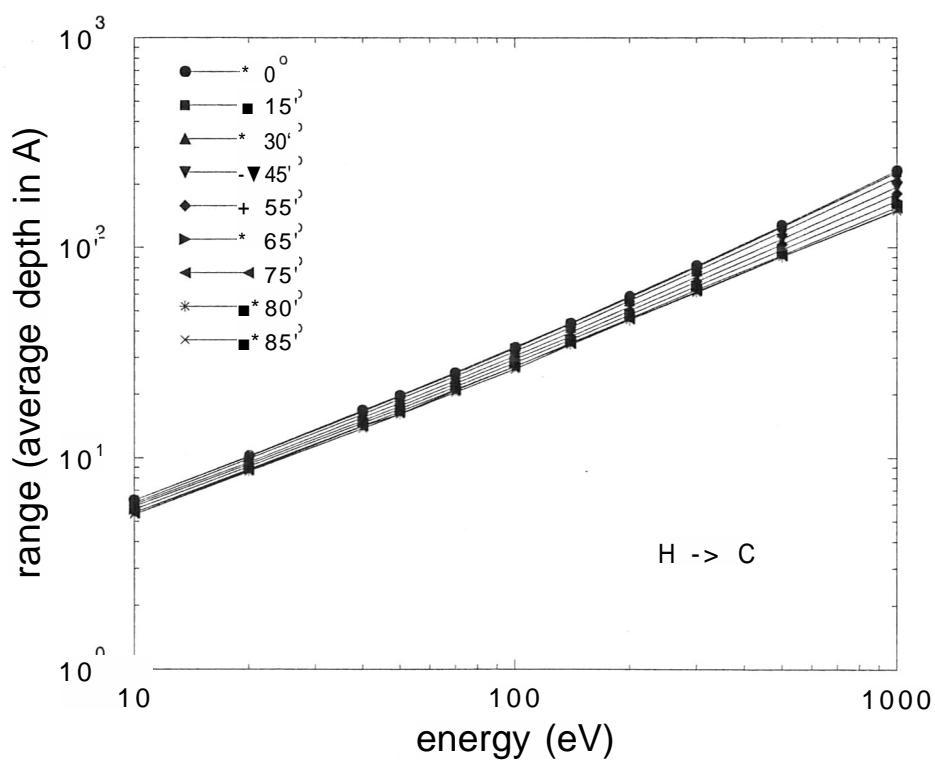
Sputter yield of C by D

zl= 1 , ml= 2.01 . z2= 6 , m2= 12.01 . Es=7.41   , rho=1.85 g/cm**3 : ne=10, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
30	.00009	.00011	.00018	.00023	.00021	.00011	.00003	.00001	.00000
40	.00081	.00094	.00129	.00180	.00205	.00166	.00076	.00032	.00010
50	.00196	.00233	.00309	.00458	.00587	.00595	.00415	.00176	.00044
70	.00479	.00519	.00701	.01127	.01571	.02143	.01778	.00860	.00157
100	.00818	.00877	.01209	.01965	.03077	.04591	.04784	.02725	.00404
140	.01102	.01205	.01676	.02875	.04403	.07028	.08632	.05726	.00817
200	.01320	.01484	.02406	.03565	.05932	.09102	.12120	.09763	.01408
300	.01467	.01658	.02405	.04328	.06809	.11290	.16260	.15110	.02936
500	.01438	.01722	.02722	.04580	.07390	.11990	.18940	.21210	.07293
1000	.01303	.01487	.02357	.04184	.06494	.10760	.18950	.23510	.17180
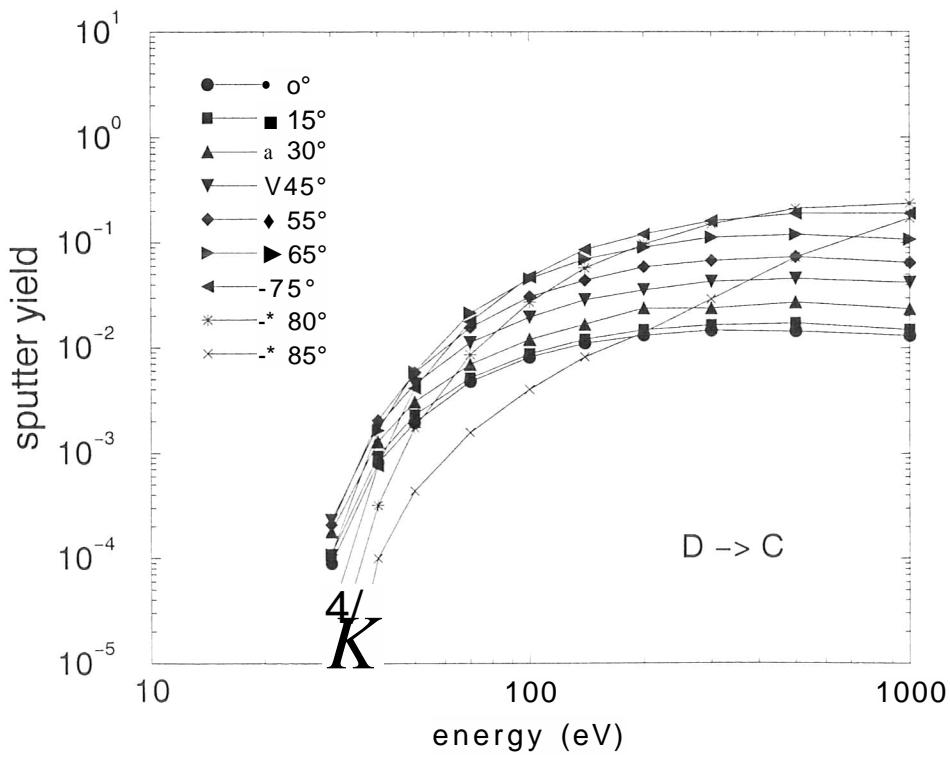
Sputtered energy of C by D

z1= 1 , m1= 2.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=10, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
30	.00000	.00000	.00001	.00001	.00001	.00001	.00000	.00000	.00000
40	.00004	.00005	.00008	.00013	.00016	.00014	.00007	.00003	.00001
50	.00012	.00015	.00022	.00036	.00051	.00057	.00044	.00020	.00005
70	.00033	.00035	.00053	.00092	.00138	.00205	.00204	.00110	.00023
100	.00053	.00060	.00088	.00150	.00256	.00429	.00549	.00355	.00057
140	.00068	.00075	.00109	.00203	.00331	.00593	.00875	.00673	.00114
200	.00071	.00080	.00118	.00219	.00399	.00660	.01038	.00995	.00173
300	.00066	.00075	.00112	.00223	.00384	.00715	.01149	.01188	.00308
500	.00050	.00058	.00103	.00187	.00319	.00590	.01014	.01255	.00540
1000	.00029	.00037	.00057	.00117	.00201	.00361	.00682	.00928	.00769
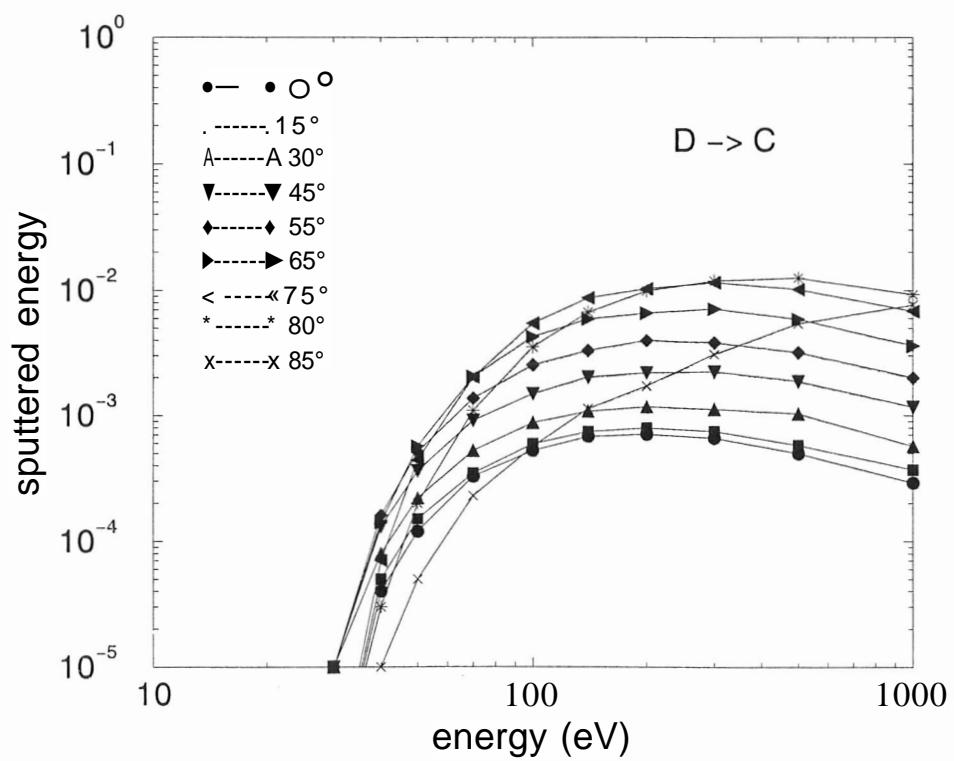
Particle reflection coefficient of D by C

z1= 1 , m1= 2.01 , z2= 6 , m2= 12.01 , Es=7.41 . rho=1.85 g/cm**3 ; ne=10. na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.37391	.39892	.47048	.60024	.70902	.82909	.92338	.95098	.96621
20	.31293	.33211	.39193	.50964	.62864	.i7879	.92137	.96385	.98389
30	.28139	.29852	.35180	.45696	.56965	.72704	.90327	.96296	.98854
40	.26151	.27746	.32752	.42337	.52894	.68322	.88223	.95850	.99052
50	.24752	.26156	.30882	.40139	.49913	.64868	.86007	.95215	.99152
70	.22734	.24098	.28632	.37150	.45899	.59903	.81953	.93702	.99212
100	.20669	.21937	.26184	.33893	.42620	.54844	.76498	.91010	.99131
140	.18792	.19981	.24057	.31715	.39671	.51107	.70962	.86946	.98955
200	.16906	.17987	.21947	.29649	.36594	.47532	.65607	.82383	.98386
300	.14771	.15673	.19452	.26384	.33955	.43810	.60403	.75273	.97088
500	.11976	.12830	.16290	.22730	.30083	.39763	.54783	.67920	.93170
1000	.07998	.08849	.11972	.18172	.25124	.35166	.49552	.60293	.83132
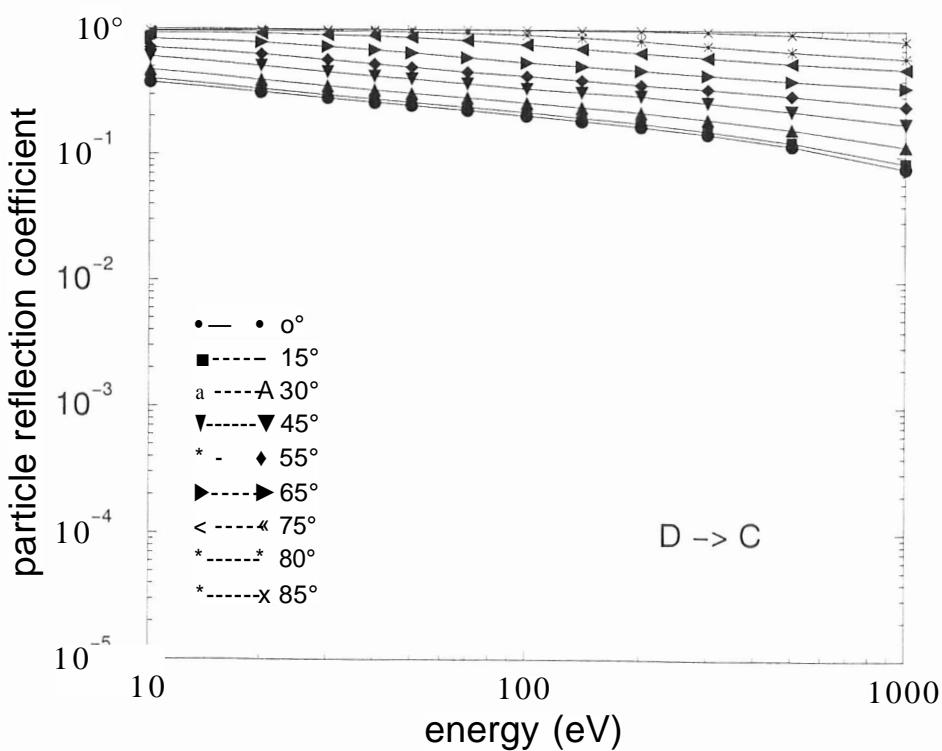
Energy reflection coefficient of D by C

z1= 1 , m1= 2.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=10, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.14664	.16413	.21776	.32902	.43929	.57649	.71142	.75982	.78901
20	.12052	.13355	.17567	.27284	.38894	.55878	.75796	.83429	.87761
30	.10641	.11700	.15289	.23513	.33992	.51345	.75126	.85306	.90826
40	.09727	.10677	.13905	.21131	.30586	.47156	.73221	.85646	.92336
50	.09099	.09922	.12873	.19563	.28145	.43801	.70914	.85335	.93208
70	.08202	.08973	.11657	.17624	.24939	.38869	.66193	.83813	.94108
100	.07329	.08020	.10424	.15596	.22236	.34045	.59864	.80615	.94600
140	.06551	.07180	.09428	.14260	.20130	.30439	.53535	.75434	.94656
200	.05734	.06341	.08416	.12980	.18117	.27409	.47453	.69267	.94063
300	.04946	.05361	.07218	.11291	.16280	.24274	.41459	.60502	.92232
500	.03830	.04220	.05792	.09242	.13677	.21003	.35352	.51040	.86655
1000	.02371	.02702	.03948	.06771	.10574	.17081	.29553	.41764	.72341

d -> c
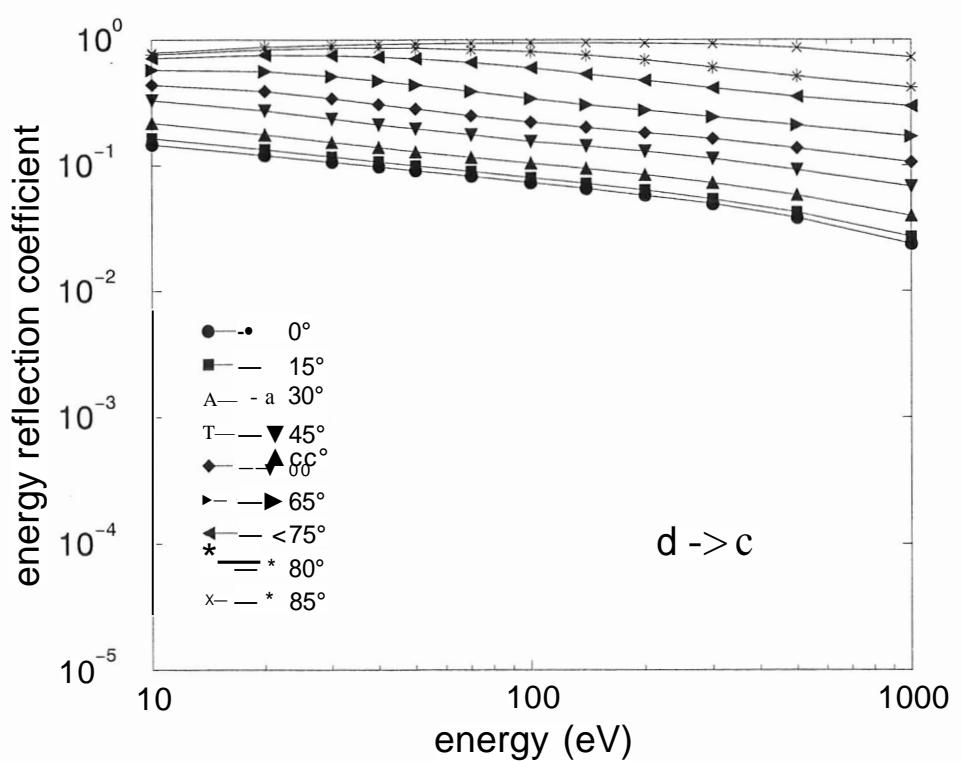
Average depth of implanted D in C

zl= 1 , ml= 2.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=ll, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	5.2	5.2	5.0	4.8	4.6	4.4	4.2	4.1	4.0
20	8.6	8.5	8.2	7.9	7.6	7.3	6.9	6.7	6.6
40	14.5	14.3	13.8	13.0	12.5	11.9	11.4	11.0	10.7
50	17.2	17.0	16.4	15.4	14.8	14.1	13.4	13.0	12.7
70	22.6	22.2	21.4	20.1	19.0	18.2	17.3	16.9	16.3
100	30.2	29.7	28.4	26.7	25.3	23.9	23.0	22.4	21.6
140	40.1	39.5	37.7	35.2	33.3	31.6	30.1	29.6	28.8
200	54.8	53.9	51.3	47.6	44.9	42.6	40.4	39.4	38.7
300	78.8	77.4	73.6	67.9	63.8	59.5	56.5	55.5	54.7
500	126.3	124.1	116.5	107.4	100.1	93.4	87.2	85.5	82.8
1000	244.8	239.2	223.8	202.1	185.6	170.0	157.0	152.2	150.6
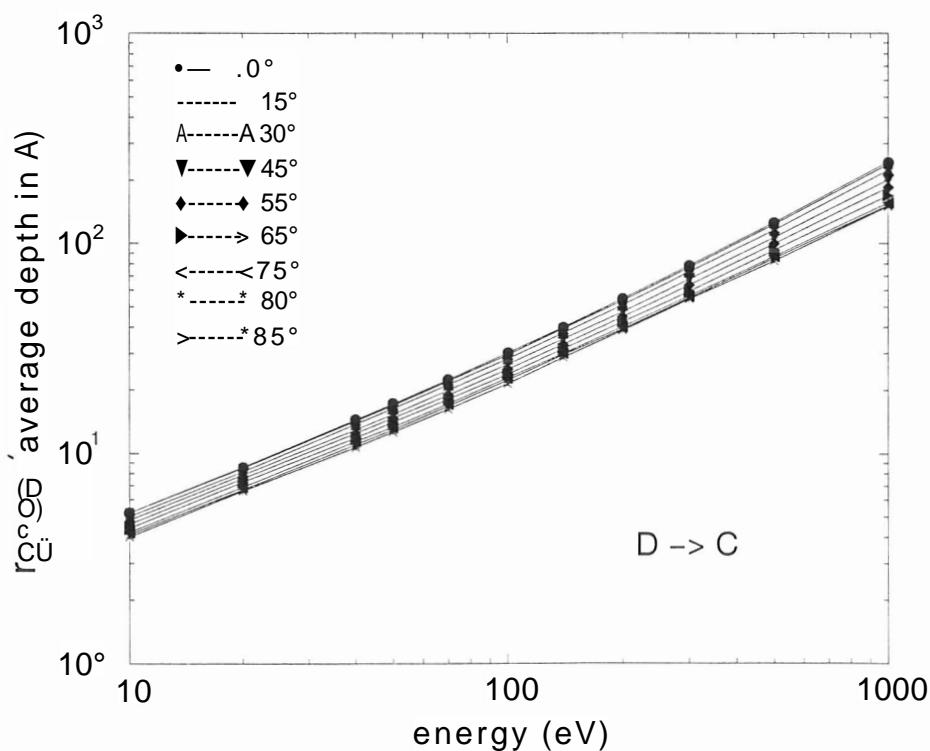
Sputter yield of C by T

zl= 1 , ml= 3.02 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=12, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00000	.00001	.00001	.00000	.00000	.00000	.00000	.00000
25	.00005	.00007	.00014	.00021	.00018	.00012	.00004	.00002	.00001
30	.00024	.00033	.00061	.00098	.00106	.00095	.00044	.00023	.00009
40	.00123	.00150	.00256	.00441	.00615	.00665	.00437	.00214	.00064
50	.00276	.00350	.00536	.00916	.01360	.01768	.01316	.00616	.00148
70	.00605	.00687	.01034	.01971	.03023	.04492	.03920	.01982	.00357
100	.00944	.01141	.01715	.03195	.05242	.07870	.08626	.04766	.00694
140	.01285	.01391	.02250	.04438	.06918	.11090	.13750	.08510	.01174
200	.01538	.01756	.02960	.05582	.08786	.14150	.19080	.14450	.02022
300	.01752	.02065	.03293	.06324	.10220	.16690	.23510	.21560	.04286
500	.01867	.02227	.03596	.06578	.10470	.17280	.26440	.29190	.09974
1000	.01678	.02018	.03324	.05976	.09557	.16100	.27000	.33980	.23610
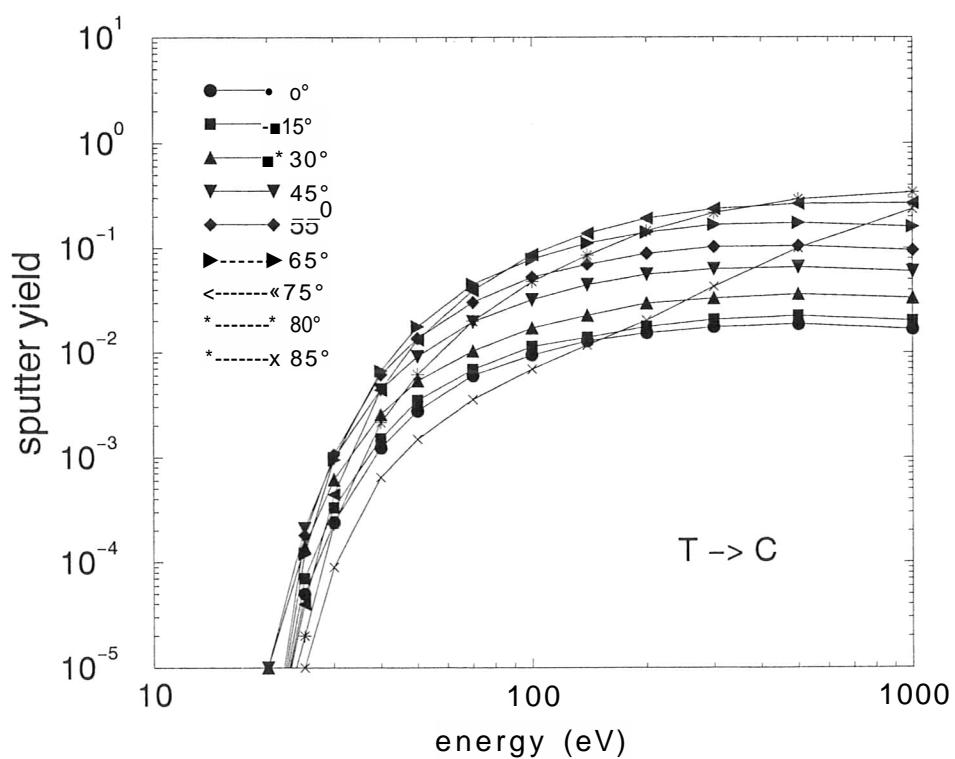
Sputtered energy of C by T

zl= 1 , ml= 3.02 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=ll, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
25	.00000	.00000	.00001	.00002	.00002	.00001	.00000	.00000	.00000
30	.00001	.00002	.00005	.00009	.00011	.00010	.00005	.00003	.00001
40	.00008	.00011	.00022	.00043	.00069	.00083	.00062	.00033	.00010
50	.00020	.00027	.00047	.00094	.00157	.00229	.00202	.00107	.00027
70	.00045	.00056	.00089	.00193	.00324	.00571	.00629	.00355	.00069
100	.00067	.00082	.00139	.00288	.00526	.00912	.01235	.00774	.00136
140	.00084	.00093	.00158	.00349	.00622	.01143	.01723	.01253	.00216
200	.00085	.00107	.00183	.00386	.00677	.01270	.01998	.01746	.00316
300	.00084	.00102	.00173	.00366	.00679	.01213	.01983	.02094	.00534
500	.00068	.00081	.00142	.00303	.00523	.00951	.01690	.02086	.00860
1000	.00039	.00050	.00091	.00198	.00355	.00645	.01180	.01518	.01252

Particle reflection coefficient of T by C

zl= 1 , ml= 3.02 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.28928	.31348	.38980	.53170	.65800	.79233	.90399	.93795	.95587
20	.24092	.26141	.32359	.44984	.58210	.74889	.91034	.95917	.98101
25	.22584	.24405	.30271	.42047	.54837	.72089	.90139	.95936	.98492
30	.21425	.23153	.28612	.39773	.52019	.69423	.89144	.95825	.98713
40	.19687	.21262	.26321	.36562	.47786	.64885	.86929	.95343	.98947
50	.18454	.19937	.24696	.34196	.44790	.61021	.84593	.94720	.99060
70	.16742	.18155	.22487	.31129	.40778	.56022	.80112	.93018	.99141
100	.15222	.16249	.20518	.28548	.37254	.50880	.74334	.90272	.99033
140	.13652	.14859	.18720	.26396	.34422	.46882	.68588	.86050	.98775
200	.12103	.13189	.16784	.24412	.31886	.43562	.62708	.80656	.98252
300	.10547	.11627	.15242	.22239	.29524	.40424	.57432	.73514	.96750
500	.08455	.09521	.12704	.19286	.26328	.36340	.52117	.66047	.92668
1000	.05767	.06595	.09376	.15468	.22037	.31807	.46863	.58303	.82400

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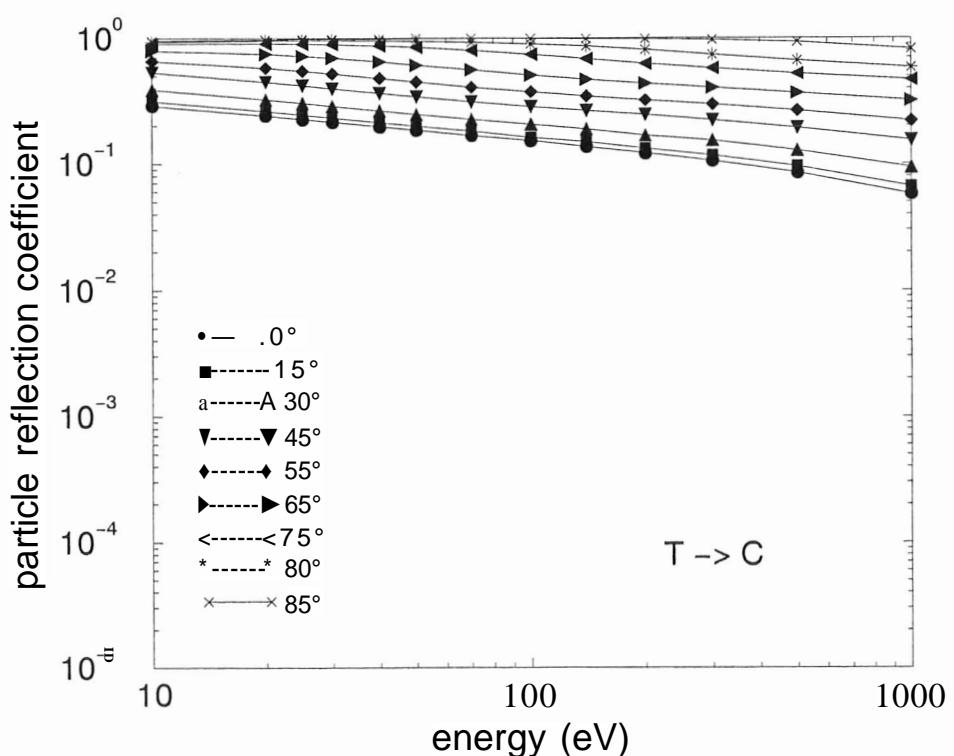
Energy reflection coefficient of T by C

z1= 1 , m1= 3.02 , z2= 6 . m2= 12.01 . Es=7.41 , rho=1.85 g/cm**3 ; ne=13. na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.08558	.09983	.14776	.25254	.36417	.50455	.65030	.70468	.13114
20	.07307	.08383	.12147	.21188	.32710	.50231	.71690	.80256	.85286
25	.06811	.01<14	.11193	.19429	.30358	.48236	.71928	.81965	.87681
30	.06421	.07313	.10432	.18049	.28304	.46104	.71547	.82872	.89284
40	.05829	.06621	.09403	.16097	.25191	.42174	.69849	.83532	.92227
50	.05410	.06141	.08675	.14727	.23028	.38717	.67677	.83383	.92404
70	.04869	.05527	.07745	.12997	.20106	.34236	.62667	.81930	.93605
100	.04370	.04846	.06918	.11630	.17781	.29675	.56392	.78753	.94237
140	.03874	.04397	.06230	.10480	.16066	.26322	.50215	.73722	.94402
200	.03423	.03859	.05559	.09597	.14391	.23648	.43849	.66992	.93827
300	.02903	.03394	.04956	.08585	.13148	.21213	.38377	.58262	.91809
500	.02296	.02679	.04051	.07194	.11372	.18216	.33019	.49139	.86105
1000	.01458	.01784	.02809	.05465	.08879	.15177	.27773	.39862	.71972
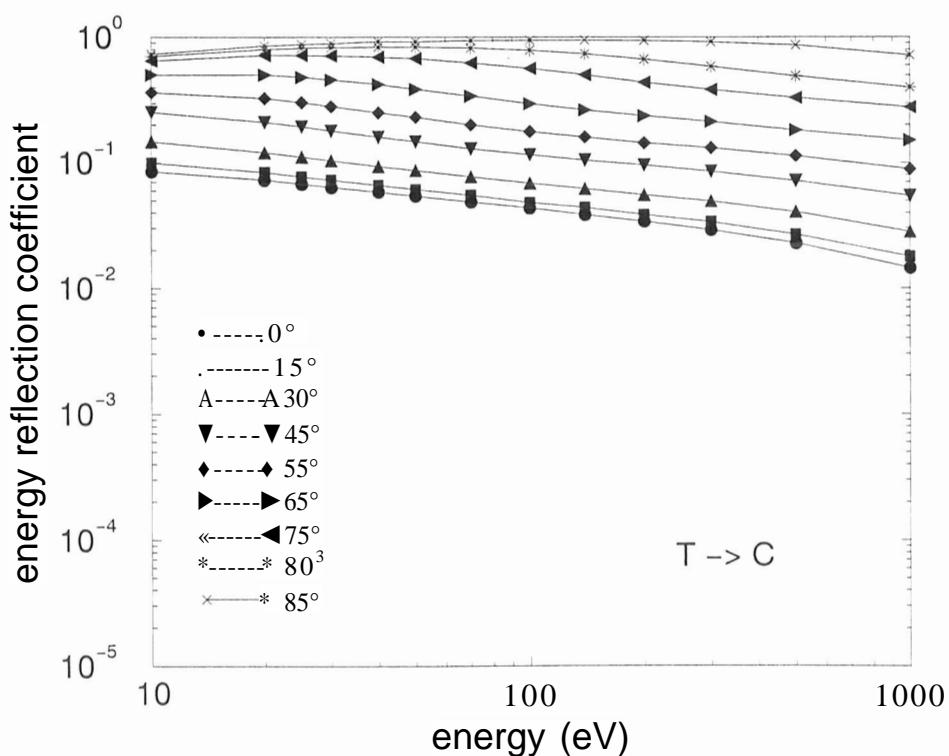
Average depth of implanted T in C

zl= 1 , ml= 3.02 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	4.6	4.5	4.4	4.1	3.9	3.6	3.3	3.2	3.0
20	7.7	7.6	7.3	6.8	6.5	6.1	5.7	5.5	5.3
25	9.2	9.0	8.6	8.1	7.6	7.2	6.7	6.5	6.2
30	10.5	10.4	9.9	9.2	8.7	8.2	7.7	7.4	7.1
40	13.2	12.9	12.3	11.5	10.8	10.2	9.5	9.2	8.8
50	15.7	15.4	14.7	13.6	12.8	12.1	11.3	10.9	10.5
70	20.6	20.2	19.2	17.7	16.6	15.7	14.7	14.2	13.4
100	27.7	27.2	25.8	23.8	22.2	20.9	19.5	18.9	17.9
140	37.1	36.3	34.4	31.6	29.6	27.4	25.9	25.0	24.3
200	50.8	50.2	47.2	43.1	40.1	37.3	34.7	34.3	32.8
300	74.1	72.6	68.3	62.4	57.5	52.7	49.6	48.1	46.0
500	120.9	118.1	110.9	100.0	92.2	84.7	78.2	76.6	74.4
1000	241.5	235.1	218.7	194.8	176.5	162.1	147.3	142.8	138.9

53
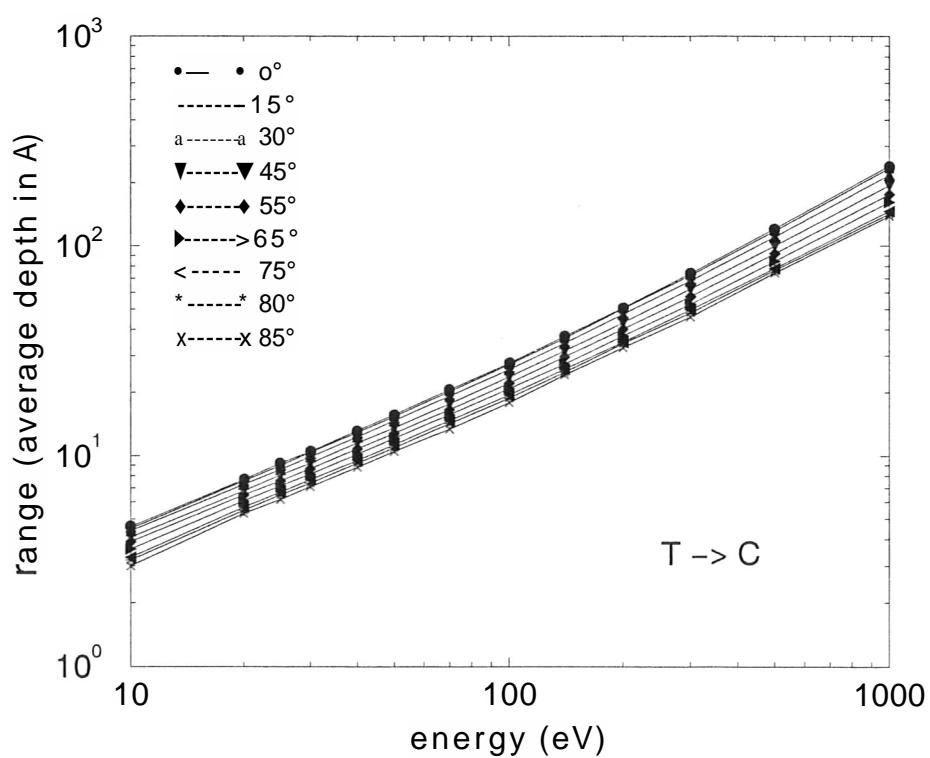
Sputter yield of C by He

$z1= 2$, $m1= 4.00$. $z2= 6$, $m2= 12.01$, $Es=7.41$, $rho=1.85$ g/cm**3 : $ne=22$, $na=9$

Eq (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00001	.00002	.00002	.00001	.00000	.00000	.00000	.00000
25	.00004	.00007	.00015	.00019	.00017	.00012	.00004	.00001	.00000
27	.00010	.00015	.00030	.00043	.00043	.00035	.00012	.00002	.00000
30	.00024	.00037	.00070	.00110	.00125	.00112	.00038	.00006	.00000
35	.00072	.00100	.00197	.00333	.00417	.00404	.00139	.00021	.00000
40	.00150	.00203	.00386	.00720	.00933	.00926	.00322	.00047	.00000
50	.00383	.00503	.00912	.01747	.02453	.02595	.00971	.00153	.00001
60	.00684	.00861	.01503	.02940	.04306	.04732	.01948	.00340	.00001
70	.01008	.01224	.02069	.04128	.06234	.07140	.03304	.00627	.00002
100	.01826	.02232	.03698	.07358	.11270	.14350	.08370	.02020	.00008
140	.02628	.03222	.05315	.10240	.16120	.21910	.15830	.04813	.00026
200	.03449	.04231	.07040	.13500	.20710	.29490	.26510	.10430	.00095
300	.01279	.05361	.08654	.16360	.25020	.36780	.38990	.21250	.00403
400	.01750	.05797	.09450	.17570	.27070	.40550	.47900	.31920	.01086
500	.05051	.06119	.09958	.18270	.28070	.42380	.53310	.41160	.02254
700	.05173	.06296	.10280	.18680	.29000	.43770	.59900	.54060	.06419
1000	.05193	.06280	.10040	.18600	.28400	.43630	.63820	.65770	.15850
2000	.04694	.05632	.08841	.15650	.24440	.39270	.63830	.75800	.49330
3000	.04242	.04914	.07563	.13610	.21090	.34540	.59100	.74880	.67340
5000	.03401	.03997	.05793	.10710	.16600	.27430	.49810	.68300	.79190
10000	.02433	.02760	.04040	.06844	.10460	.18110	.35000	.52270	.76710
20000	.01660	.01855	.02646	.04134	.06317	.10720	.22280	.34780	.60990

He -> C

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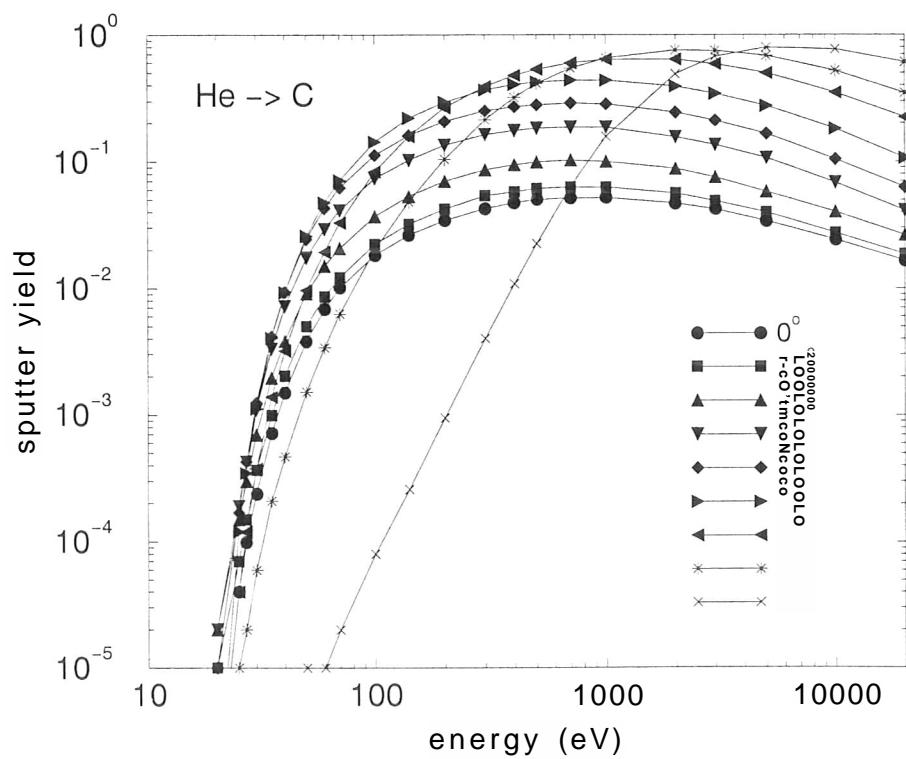
Sputtered energy of C by He
z1= 2 , m1= 4.00 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=21, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
25	.00000	.00000	.00001	.00002	.00002	.00002	.00001	.00000	.00000
27	.00001	.00001	.00003	.00004	.00005	.00005	.00002	.00000	.00000
30	.00002	.00003	.00006	.00012	.00015	.00016	.00006	.00001	.00000
35	.00005	.00008	.00019	.00038	.00055	.00060	.00024	.00004	.00000
40	.00011	.00016	.00038	.00086	.00127	.00149	.00061	.00009	.00000
50	.00028	.00041	.00089	.00211	.00344	.00431	.00196	.00034	.00000
60	.00050	.00070	.00146	.00344	.00595	.00781	.00401	.00076	.00000
70	.00074	.00097	.00192	.00471	.00836	.01152	.00675	.00141	.00001
100	.00129	.00166	.00309	.00741	.01349	.02107	.01561	.00441	.00002
140	.00168	.00214	.00410	.00920	.01681	.02765	.02566	.00923	.00005
200	.00195	.00248	.00458	.01047	.01852	.03124	.03550	.01674	.00017
300	.00201	.00261	.00474	.01045	.01857	.03120	.04036	.02642	.00064
400	.00193	.00246	.00469	.00993	.01736	.02968	.04169	.03263	.00149
500	.00185	.00224	.00424	.00943	.01633	.02770	.04087	.03606	.00266
700	.00155	.00200	.00372	.00813	.01406	.02442	.03740	.03821	.00607
1000	.00126	.00165	.00316	.00694	.01216	.01987	.03287	.03682	.01112
2000	.00074	.00098	.00189	.00403	.00717	.01293	.02296	.02879	.02071
3000	.00053	.00066	.00128	.00296	.00517	.00962	.01766	.02273	.02101
5000	.00029	.00039	.00073	.00172	.00314	.00601	.01178	.01617	.01812
10000	.00012	.00017	.00033	.00076	.00136	.00280	.00603	.00909	.01187
20000	.00005	.00008	.00016	.00031	.00059	.00110	.00277	.00437	.00688
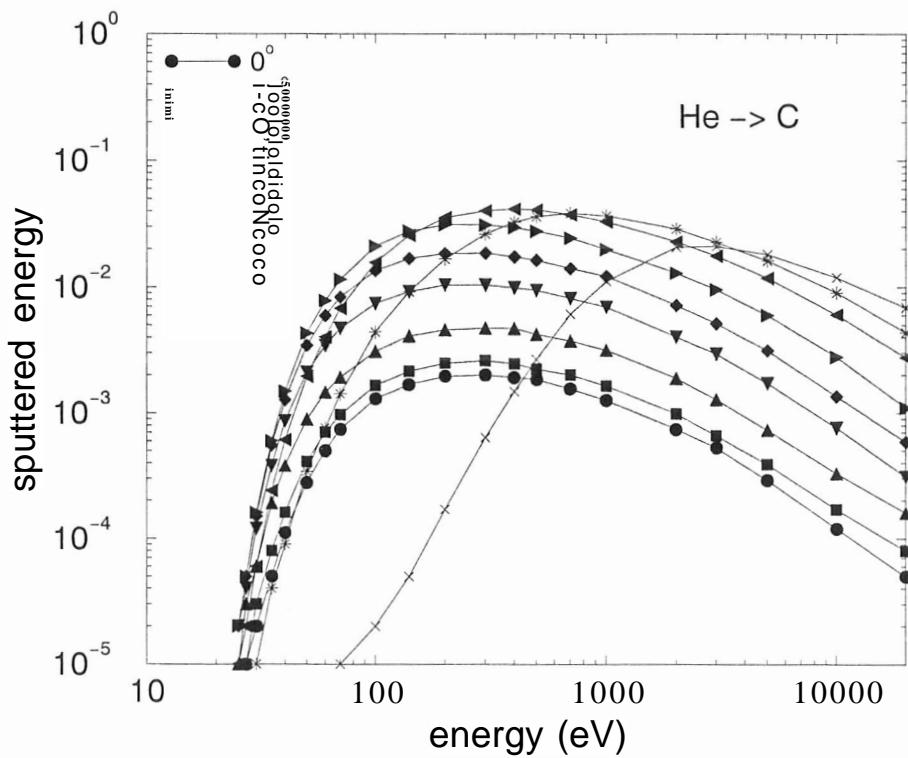
Particle reflection coefficient   of He by C

zl= 2 , ml= 4.00 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=24, na=9

E_o (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.40939	.44438	.53732	.69277	.81642	.93132	.99161	.99914	1.00000
15	.33973	.37185	.46405	.62865	.76632	.90782	.98924	.99899	1.00000
20	.29583	.32389	.40950	.57280	.72094	.88207	.98571	.99873	1.00000
25	.26550	.29104	.37000	.52741	.68013	.85574	.98136	.99839	1.00000
27	.25620	.28041	.35737	.51151	.66433	.84547	.97943	.99823	0.99999
30	.24368	.26707	.34037	.49045	.64309	.83009	.97634	.99796	0.99999
35	.22709	.24832	.31767	.45988	.61220	.80508	.97051	.99746	0.99999
40	.21410	.23416	.29938	.43546	.58309	.78209	.96437	.99679	1.00000
50	.19364	.21250	.27294	.39650	.53688	.73907	.95030	.99519	.99999
60	.18028	.19778	.25375	.36823	.50193	.69983	.93578	.99327	.99999
70	.16950	.18564	.23842	.34675	.47156	.66778	.91877	.99074	.99999
100	.14711	.16134	.20700	.30362	.41426	.59116	.87091	.98037	.99996
140	.12953	.14432	.18490	.27230	.36997	.53026	.80940	.96134	.99991
200	.11347	.12483	.16376	.24299	.32988	.46985	.73252	.92491	.99971
300	.09737	.10847	.14231	.21639	.29866	.42379	.65032	.86129	.99875
400	.08729	.09597	.13087	.20010	.27596	.38994	.59784	.80418	.99644
500	.07994	.08839	.11946	.18632	.26118	.37398	.56384	.75797	.99227
700	.06874	.07684	.10678	.17054	.23996	.34796	.52431	.69091	.97753
1000	.05746	.06428	.09362	.15316	.22014	.32410	.49003	.63292	.94170
2000	.03787	.04374	.06714	.11861	.18169	.28126	.43343	.55398	.81659
3000	.02779	.03362	.05181	.09823	.15836	.25635	.40675	.52078	.74427
5000	.01743	.02069	.03565	.07223	.12595	.21886	.36853	.47932	.66904
10000	.00781	.00970	.01721	.04202	.08141	.16427	.31225	.42699	.60103
20000	.00321	.00399	.00713	.01830	.04268	.10542	.24795	.36617	.54728
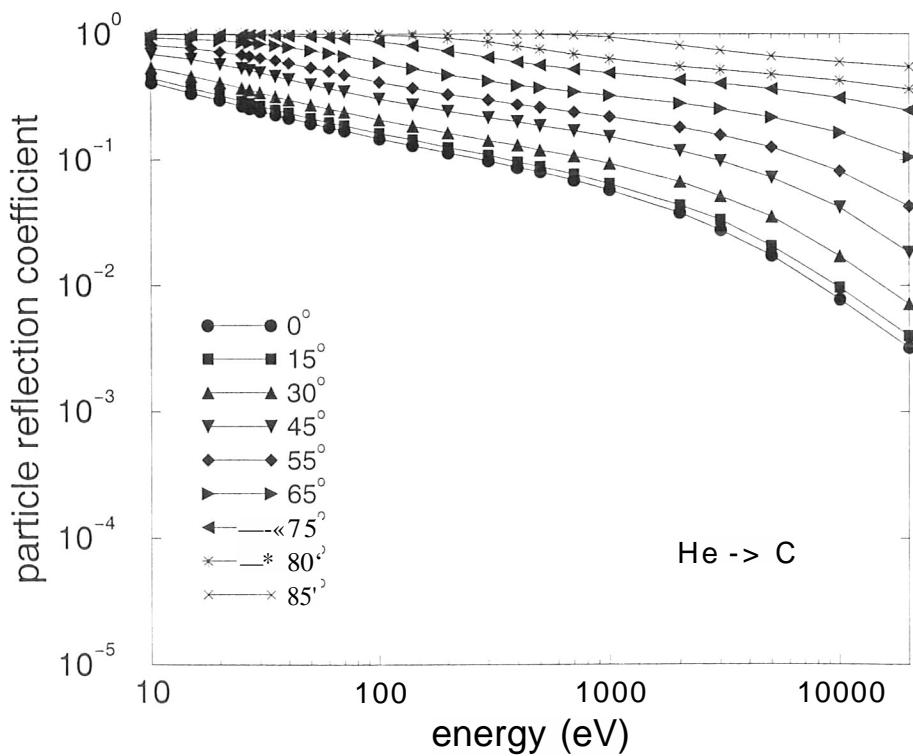
Energy reflection coefficient of He by C

zl= 2 , ml= 4.00 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85   g/cm**3 ; ne=24, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.09490	.11579	.17909	.32032	.44947	.63501	.83128	.90821	.96107
15	.08046	.09760	.15453	.28224	.42425	.62254	.83847	.91961	.97023
20	.07022	.08456	.13454	.25459	.39691	.60319	.83812	.92471	.97438
25	.06282	.07527	.11955	.23046	.37032	.58175	.83409	.92700	.97685
27	.06048	.07228	.11470	.22205	.35976	.57303	.83195	.92744	.97755
30	.05736	.06844	.10823	.21041	.34516	.55981	.82805	.92772	.97837
35	.05319	.06312	.09944	.19356	.32386	.53826	.82062	.92752	.97937
40	.04991	.05905	.09271	.18023	.30373	.51794	.81243	.92660	.98004
50	.04477	.05287	.08258	.15927	.27145	.47993	.79409	.92367	.98077
60	.04134	.04839	.07557	.14457	.24718	.44521	.77522	.91943	.98107
70	.03857	.04526	.07015	.13295	.22661	.41736	.75414	.91437	.98114
100	.03308	.03867	.05933	.11195	.18955	.35023	.69650	.89501	.98069
140	.02878	.03408	.05155	.09721	.16144	.29756	.62530	.86476	.97951
200	.02504	.02937	.04535	.08407	.13827	.25073	.53812	.81325	.97726
300	.02139	.02500	.03865	.07317	.12068	.21478	.45047	.72866	.97249
400	.01906	.02212	.03573	.06782	.10981	.19106	.39532	.65662	.96590
500	.01724	.02015	.03186	.06205	.10217	.18033	.36119	.59748	.95693
700	.01493	.01760	.02833	.05552	.09186	.16407	.32112	.51807	.93100
1000	.01221	.01457	.02463	.04947	.08275	.14850	.28884	.44964	.87708
2000	.00771	.00944	.01681	.03582	.06460	.12179	.23787	.35964	.70070
3000	.00547	.00699	.01242	.02840	.05361	.10523	.21305	.32102	.59924
5000	.00322	.00406	.00789	.01911	.03886	.08184	.17827	.27454	.49532
10000	.00133	.00171	.00339	.00935	.02080	.05086	.12907	.21458	.39517
20000	.00051	.00063	.00123	.00349	.00871	.02525	.08025	.14941	.30898
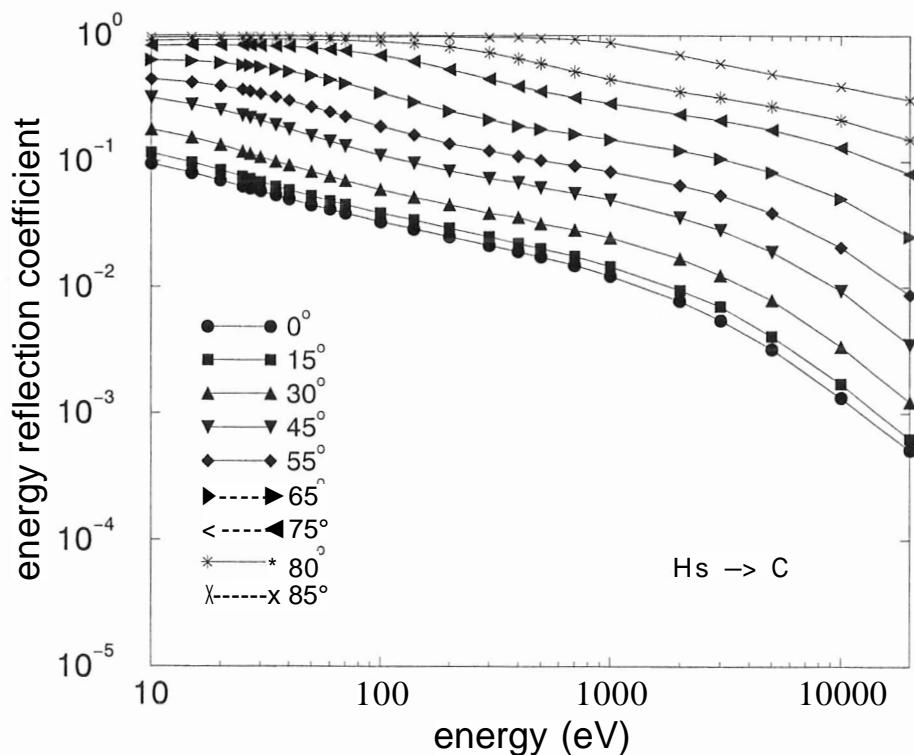
Average depth of implanted He in C
z1= 2 , m1= 4.00 . z2= 6 . m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=24. na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	3.1	3.0	2.9	2.7	2.6	2.4	2.1	1.8	1.4
15	4.0	4.0	3.8	3.6	3.4	3.1	2.8	2.5	1.9
20	4.9	4.8	4.6	4.3	4.1	3.8	3.4	3.1	2.6
25	5.7	5.6	5.4	5.0	4.7	4.4	3.9	3.6	3.2
27	6.0	5.9	5.7	5.3	5.0	4.6	4.1	3.8	3.2
30	6.5	6.4	6.1	5.7	5.4	5.0	4.5	4.1	3.7
35	7.2	7.1	6.8	6.3	5.9	5.5	5.0	4.6	4.3
40	8.0	7.8	7.5	6.9	6.5	6.0	5.4	5.0	4.4
50	9.4	9.2	8.7	8.1	7.6	7.1	6.1	5.9	4.9
60	10.7	10.5	10.0	9.2	8.6	8.0	7.3	6.8	5.9
70	12.0	11.8	11.2	10.3	9.6	8.9	8.1	7.6	6.7
100	15.8	15.5	14.7	13.4	12.4	11.5	10.7	10.0	9.3
140	20.7	20.2	19.0	17.3	16.1	14.9	13.7	13.0	11.4
200	27.6	27.0	25.4	23.0	21.2	19.5	18.1	17.1	15.5
300	38.9	38.0	35.6	32.2	29.4	27.0	24.9	24.2	22.3
400	50.1	49.0	45.6	41.3	37.7	34.5	31.7	30.4	28.5
500	61.2	59.8	55.8	50.3	46.0	41.6	38.3	37.0	35.0
700	83.5	81.3	75.6	67.5	61.8	55.8	50.8	48.9	47.3
1000	116.7	113.7	105.4	93.9	85.1	76.6	69.9	66.5	64.7
2000	228.9	222.9	205.1	180.5	161.5	143.8	128.7	122.9	119.1
3000	342.4	332.0	304.6	264.5	235.8	206.9	183.0	174.6	168.3
5000	565.7	548.4	499.4	429.0	376.5	325.9	281.6	266.2	254.5
10000	1098.6	1062.6	961.0	807.5	694.5	581.1	486.8	450.3	425.5
20000	2040.6	1972.9	1773.3	1466.4	1227.2	988.5	783.5	705.6	655.2

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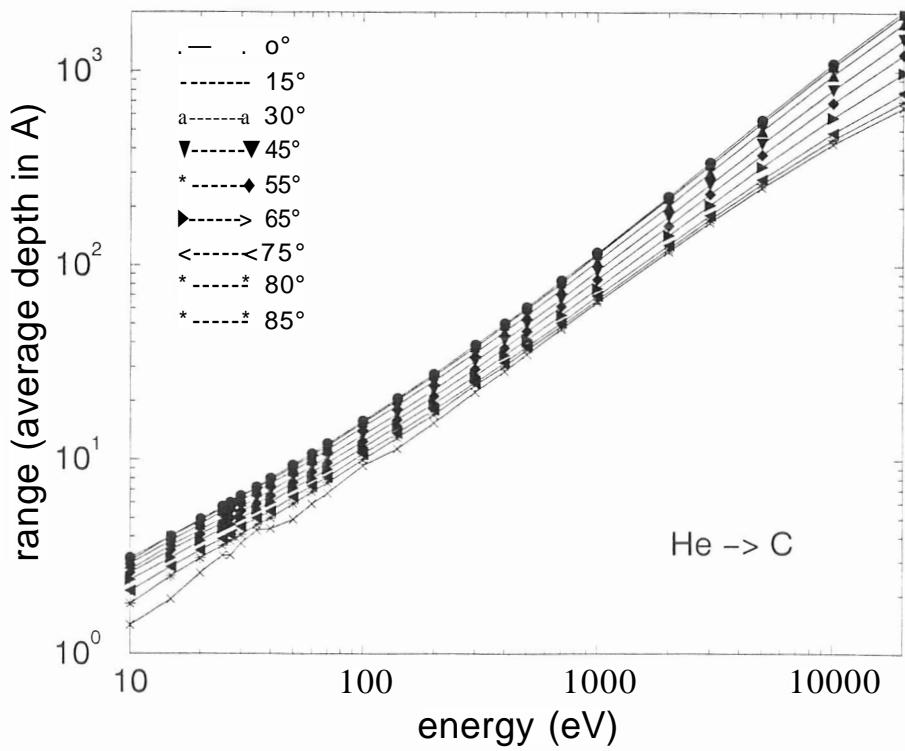
Sputter yield of C by C

z1= 6 , m1= 12.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=16, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
8	.00000	.00000	.00000	.00000	.00000	.00000	.00001	.00001	.00001
10	.00000	.00000	.00000	.00001	.00002	.00003	.00004	.00004	.00004
12	.00000	.00000	.00000	.00002	.00005	.00007	.00008	.00009	.00009
15	.00000	.00000	.00002	.00009	.00015	.00020	.00024	.00026	.00026
20	.00000	.00001	.00008	.00036	.00067	.00118	.00173	.00195	.00205
25	.00000	.00003	.00028	.00128	.00290	.00502	.00661	.00713	.00712
30	.00002	.00010	.00081	.00395	.00802	.01305	.01553	.01552	.01603
40	.00014	.00060	.00373	.01556	.02852	.04060	.04158	.03997	.03845
50	.00052	.00189	.01038	.03582	.05806	.07504	.07570	.07032	.06366
70	.00257	.00731	.03009	.08402	.13420	.16270	.15060	.12770	.11010
100	.00884	.01962	.06527	.16550	.24500	.28910	.24490	.19920	.15350
140	.02132	.03949	.11120	.25210	.37350	.44260	.36530	.26040	.18250
200	.04137	.06756	.16310	.34920	.51560	.63300	.51400	.35290	.21120
300	.07163	.10630	.22650	.45980	.68250	.86290	.74160	.49430	.24220
500	.11620	.16130	.30540	.59840	.89090	1.17800	1.15200	.79230	.30140
1000	.17780	.22790	.39330	.73750	1.09900	1.55300	1.77100	1.44800	.49210
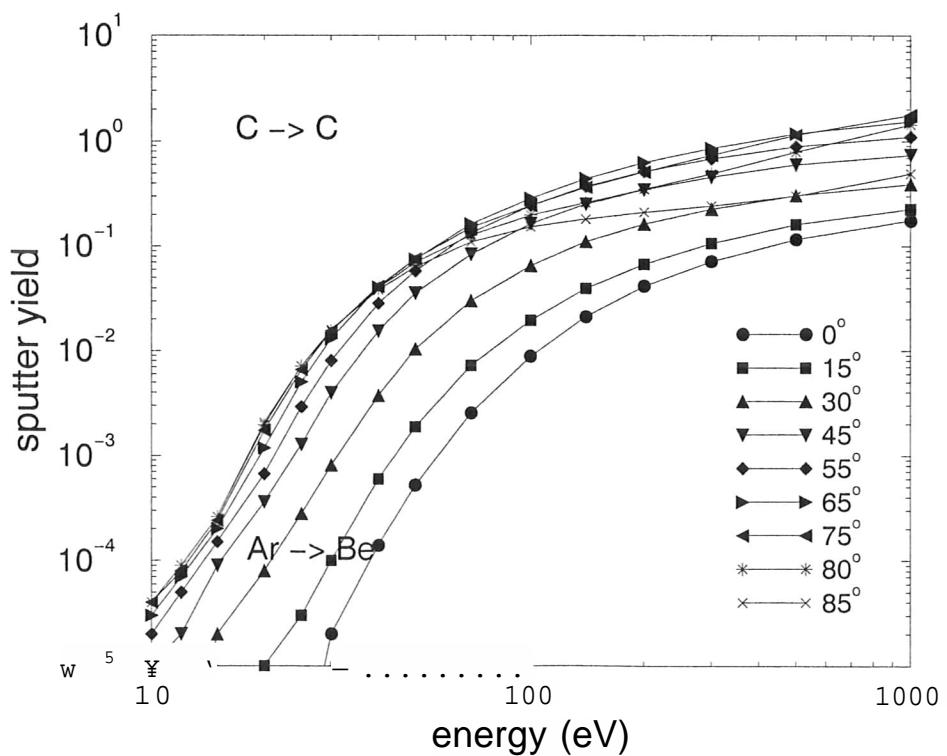
Sputtered energy of C by C

zl= 6 , ml= 12.01 , z2= 6 . m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00000	.00000	.00000	.00000	.00001	.00001	.00001
12	.00000	.00000	.00000	.00000	.00001	.00001	.00001	.00002	.00002
15	.00000	.00000	.00000	.00001	.00002	.00003	.00004	.00005	.00005
20	.00000	.00000	.00001	.00005	.00011	.00023	.00038	.00044	.00048
25	.00000	.00000	.00003	.00019	.00052	.00106	.00161	.00174	.00180
30	.00000	.00001	.00009	.00062	.00157	.00294	.00389	.00407	.00432
40	.00001	.00005	.00043	.00252	.00571	.00961	.01123	.01118	.01098
50	.00003	.00015	.00117	.00577	.01149	.01798	.02077	.01998	.01812
70	.00013	.00051	.00308	.01265	.02468	.03677	.04006	.03516	.03102
100	.00041	.00121	.00600	.02193	.04060	.05901	.06045	.05145	.04065
140	.00089	.00216	.00886	.02894	.05320	.07707	.07891	.06059	.04483
200	.00157	.00326	.01127	.03396	.06183	.09293	.09349	.07175	.04661
300	.00235	.00440	.01317	.03675	.06561	.10070	.10900	.08233	.04478
500	.00312	.00529	.01395	.03700	.06524	.10250	.12520	.10020	.04320
1000	.00348	.00541	.01295	.03270	.05684	.09423	.12570	.11760	.04883
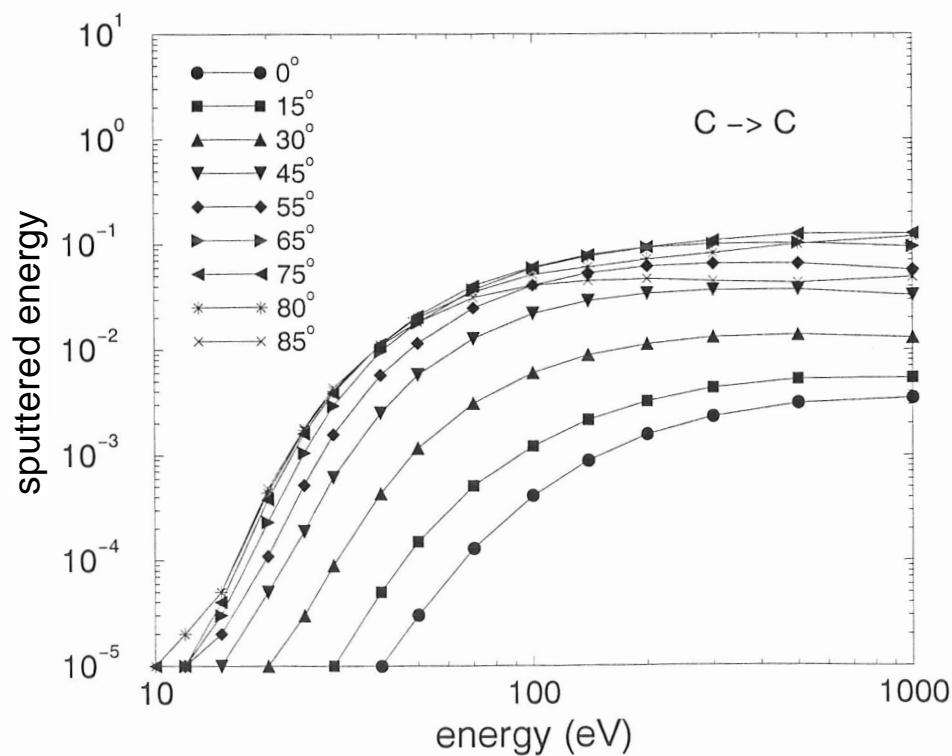
Particle reflection coefficient of C by C

$z1 = 6$, $m1 = 12.01$, $z2 = 6$, $m2 = 12.01$, $Es = 7.41$, $rho = 1.85$ g/cm**3 ; ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
12	.00000	.00000	.00000	.00000	.00000	.00000	.00001	.00001	.00001
15	.00000	.00000	.00000	.00000	.00002	.00011	.00037	.00051	.00065
20	.00000	.00000	.00001	.00022	.00114	.00369	.00811	.01018	.01169
25	.00000	.00000	.00014	.00199	.00719	.01778	.03262	.03944	.04349
30	.00000	.00003	.00066	.00627	.01978	.04426	.07301	.08644	.09394
40	.00003	.00026	.00316	.02162	.05603	.11235	.17479	.20278	.22036
50	.00011	.00074	.00647	.03742	.09154	.18126	.28192	.32456	.35551
70	.00042	.00197	.01299	.06250	.14343	.27953	.45150	.52992	.57612
100	.00111	.00376	.01964	.07981	.17774	.35127	.58753	.68853	.75845
140	.00214	.00552	.02341	.08521	.18272	.37020	.63405	.76720	.85337
200	.00338	.00728	.02607	.08479	.17692	.35017	.63923	.79073	.89250
300	.00436	.00844	.02532	.08103	.16190	.32310	.60785	.78793	.91803
500	.00532	.00891	.02447	.07093	.13870	.27340	.53565	.74005	.92790
1000	.00484	.00734	.02052	.05913	.11678	.22437	.44600	.63647	.90860
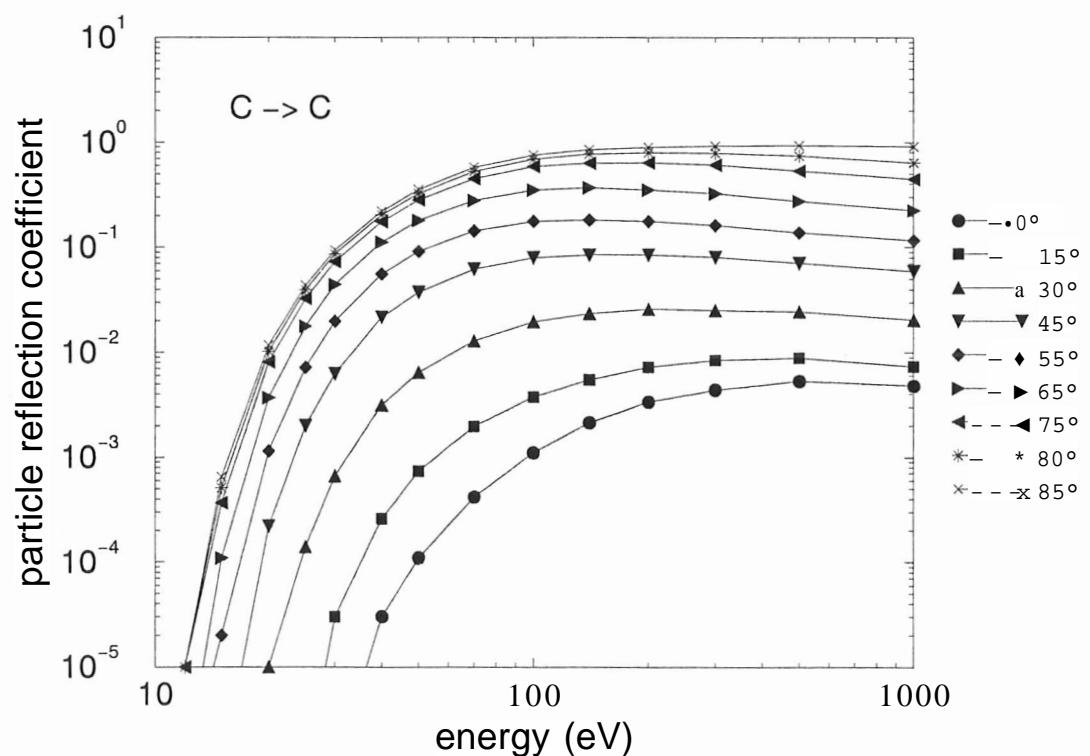
Energy reflection coefficient of C by C
z1= 6 . m1= 12.01 , z2= 6 , m2= 12.01 , Es=7.41 . rho=1.85 g/cm**3 ; ne=13, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
15	.00000	.00000	.00000	.00000	.00000	.00002	.00008	.00011	.00014
20	.00000	.00000	.00000	.00004	.00022	.00085	.00211	.00278	.00329
25	.00000	.00000	.00002	.00036	.00161	.00477	.00999	.01279	.01447
30	.00000	.00000	.00009	.00125	.00493	.01317	.02489	.03120	.03481
40	.00000	.00003	.00048	.00483	.01557	.03793	.06820	.08337	.09359
50	.00001	.00007	.00099	.00869	.02694	.06523	.11847	.14457	.16380
70	.00003	.00019	.00199	.01460	.04452	.10882	.20968	.26170	.29652
100	.00007	.00034	.00282	.01837	.05608	.14380	.29963	.38085	.44325
140	.00013	.00048	.00319	.01914	.05634	.15488	.34910	.47019	.55689
200	.00020	.00059	.00344	.01812	.05191	.14552	.36862	.51945	.64106
300	.00025	.00064	.00311	.01600	.04596	.13050	.35639	.54332	.71201
500	.00029	.00065	.00290	.01318	.03579	.10261	.30155	.51576	.76254
1000	.00027	.00052	.00230	.01052	.02839	.07577	.23284	.12662	.77497
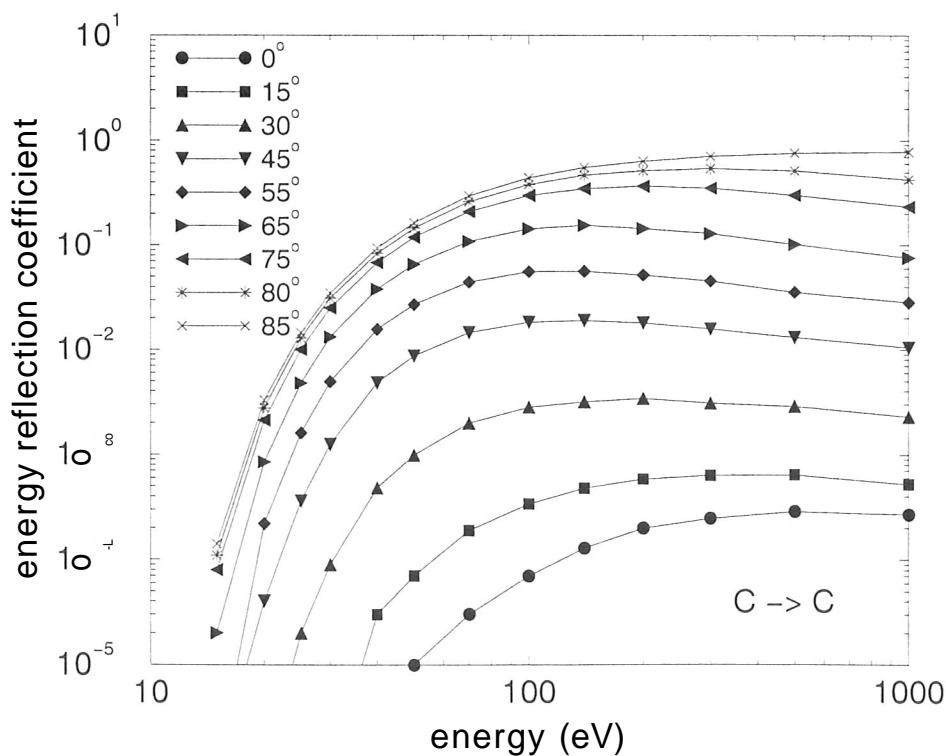
Average depth of implanted C in C

z1= 6 , m1= 12.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	1.3	1.2	1.1	0.9	0.8	0.7	0.6	0.6	0.6
15	1.8	1.7	1.5	1.2	0.9	0.7	0.5	0.5	0.4
20	2.3	2.2	1.9	1.5	1.1	0.8	0.6	0.5	0.4
25	2.8	2.7	2.3	1.8	1.3	0.9	0.6	0.5	0.5
30	3.2	3.1	2.7	2.0	1.5	1.1	0.7	0.6	0.5
40	4.0	3.8	3.3	2.6	2.0	1.4	0.9	0.8	0.6
50	4.7	4.5	3.9	3.1	2.4	1.8	1.1	0.9	0.8
70	6.0	5.8	5.1	4.1	3.3	2.5	1.7	1.4	1.2
100	7.7	7.4	6.7	5.5	4.6	3.8	2.8	2.3	1.9
140	9.8	9.5	8.5	7.2	6.2	5.2	4.0	3.5	3.0
200	12.7	12.3	11.1	9.4	8.2	6.9	5.7	5.0	4.2
300	17.1	16.5	15.0	12.7	11.0	9.4	7.9	7.1	6.0
500	25.1	24.3	22.0	18.7	16.3	13.8	11.7	10.7	9.5
1000	43.4	42.0	38.0	32.2	27.8	23.8	20.3	18.5	17.1

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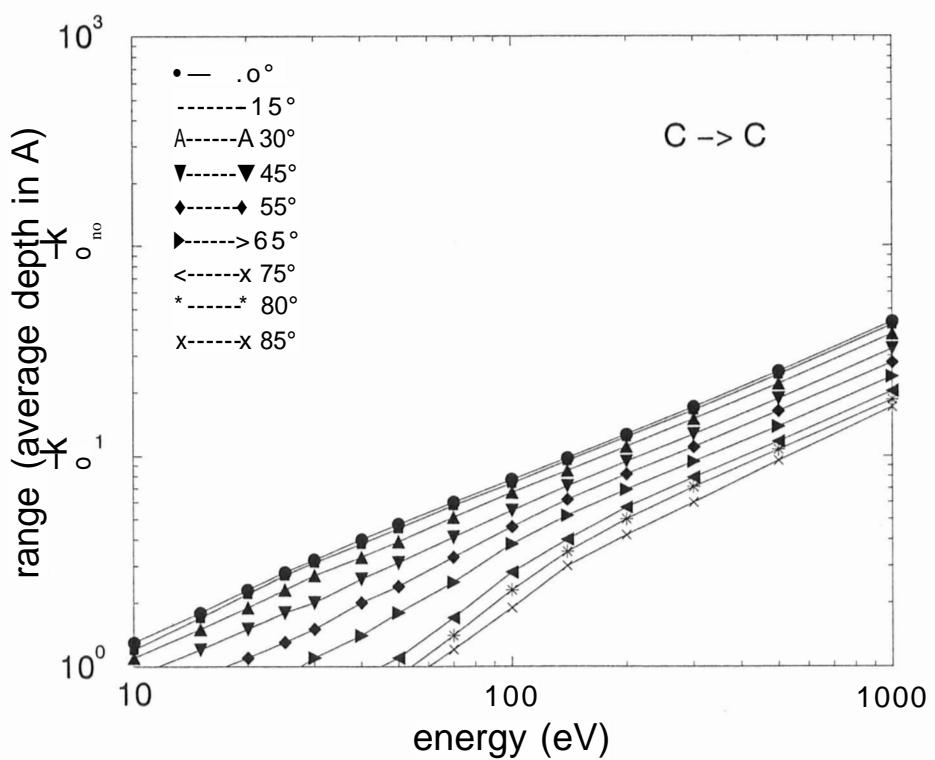
Sputter yield of C by N
z1= 7 , m1= 14.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=13. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
15	.00000	.00000	.00000	.00001	.00002	.00001	.00001	.00000	.00000
20	.00000	.00000	.00001	.00010	.00014	.00016	.00013	.00009	.00006
25	.00000	.00000	.00008	.00037	.00082	.00136	.00098	.00057	.00029
30	.00000	.00002	.00024	.00140	.00341	.00510	.00315	.00158	.00067
40	.00002	.00016	.00170	.00934	.01847	.02197	.01098	.00446	.00146
50	.00012	.00074	.00603	.02680	.04570	.04888	.02249	.00825	.00206
70	.00111	.00430	.02376	.07849	.11950	.12240	.05447	.01774	.00289
100	.00553	.01500	.05976	.16380	.24190	.25250	.11390	.03475	.00366
110	.01635	.03470	.10750	.26230	.38420	.41880	.20540	.06236	.00454
200	.03680	.06423	.16740	.37480	.55170	.63120	.35680	.11550	.00618
300	.06941	.10600	.23900	.50600	.74550	.90750	.61970	.22720	.01030
500	.12060	.16840	.33020	.65550	.97790	1.27500	1.10000	.51600	.02447
1000	.19600	.25300	.43990	.83150	1.23700	1.73600	1.89800	1.29400	.10800
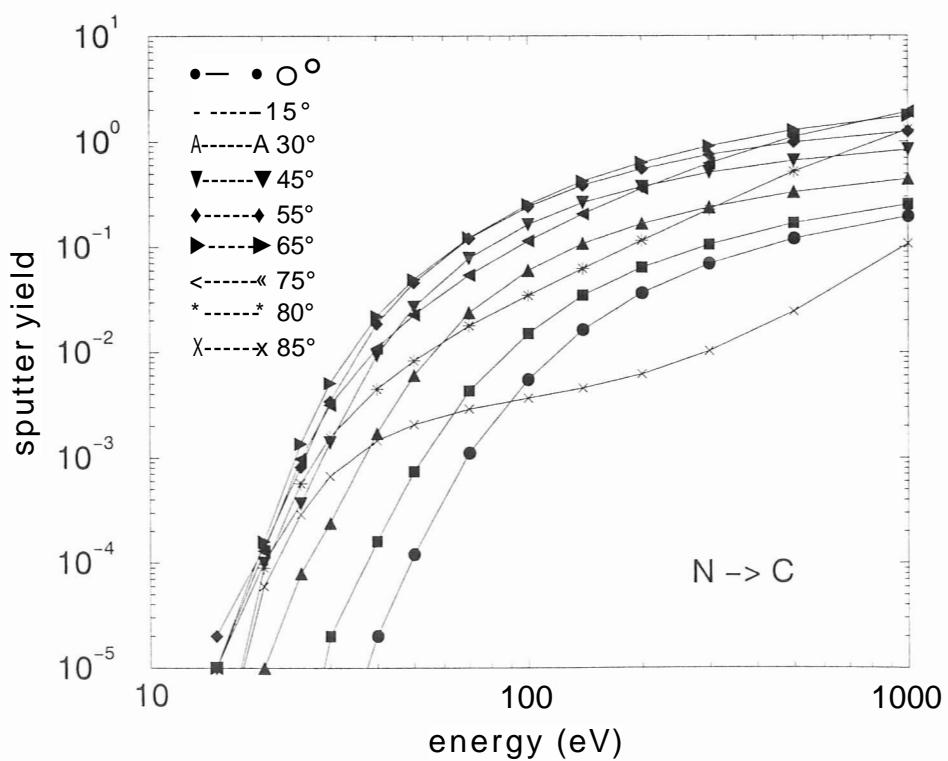
Sputtered energy of C by N

zl= 7 , ml= 14.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85   g/cm**3 ; ne=12, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00000	.00000	.00001	.00002	.00003	.00002	.00002	.00001
25	.00000	.00000	.00001	.00004	.00012	.00024	.00020	.00013	.00007
30	.00000	.00000	.00002	.00018	.00056	.00103	.00074	.00039	.00017
40	.00000	.00001	.00017	.00138	.00342	.00500	.00290	.00122	.00041
50	.00001	.00005	.00062	.00411	.00878	.01164	.00626	.00234	.00057
70	.00005	.00028	.00233	.01161	.02248	.02873	.01517	.00508	.00078
100	.00023	.00087	.00528	.02182	.04112	.05399	.02998	.00943	.00089
140	.00064	.00181	.00844	.03016	.05628	.07810	.04855	.01551	.00097
200	.00131	.00297	.01130	.03635	.06757	.09755	.07185	.02529	.00112
300	.00220	.00421	.01361	.04017	.07261	.10960	.09844	.04159	.00159
500	.00313	.00539	.01495	.04046	.07229	.11410	.12570	.07068	.00307
1000	.00374	.00589	.01441	.03674	.06452	.10630	.14010	.11160	.01081
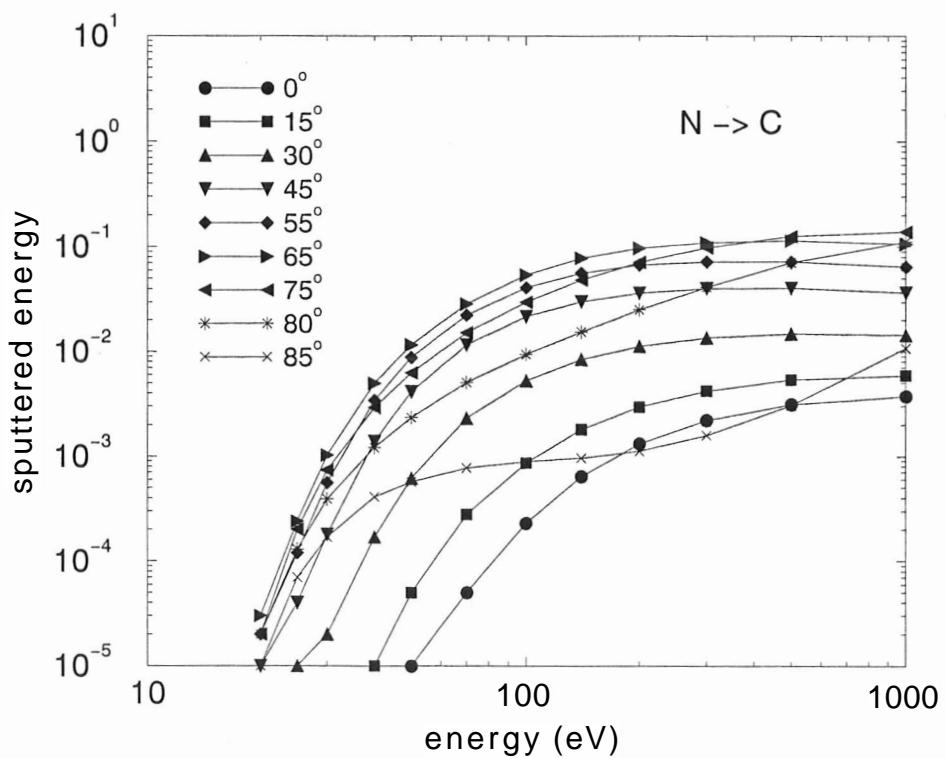
Particle reflection coefficient of N by C

z1= 7 , m1= 14.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00030	.00713	.05633	.15352	.32071	.51006	.58035	.62005
12	.00004	.00095	.01476	.09335	.22295	.42771	.63850	.71156	.75524
15	.00029	.00271	.02762	.14300	.30699	.53978	.76480	.83726	.87557
20	.00106	.00620	.04574	.19780	.39023	.63985	.86067	.92344	.95376
25	.00191	.00899	.05650	.22422	.42776	.68314	.89600	.95293	.97791
30	.00262	.01080	.06178	.23445	.44107	.69700	.91072	.96538	.98706
40	.00362	.01271	.06464	.23380	.43938	.69971	.92128	.97526	.99383
50	.00427	.01344	.06308	.22292	.42442	.68736	.92261	.97903	.99628
70	.00493	.01359	.05760	.19688	.38533	.65278	.91581	.98110	.99806
100	.00557	.01320	.05008	.16647	.33229	.59772	.89624	.97935	.99890
140	.00553	.01228	.04247	.13822	.28080	.53180	.86521	.97342	.99920
200	.00543	.01111	.03659	.11441	.23601	.45879	.81490	.96088	.99924
300	.00494	.00964	.03003	.09412	.19182	.38236	.(3(oi	.93359	.99896
500	.00445	.00791	.02359	.07361	.14968	.30362	.62042	.86793	.99767
1000	.00328	.00577	.01696	.05488	.11599	.23405	.47943	.72299	.98746

Energy reflection coefficient of N by C

zl= 7 , ml= 14.01 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85   g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00003	.00092	.01056	.03856	.10520	.20587	.25205	.28177
12	.00000	.00008	.00200	.01849	.05816	.14748	.27583	.33380	.37304
15	.00002	.00024	.00386	.02964	.08436	.19845	.36145	.43400	.48139
20	.00007	.00056	.00639	.04294	.11424	.25445	.45385	.54249	.60024
25	.00011	.00078	.00782	.04974	.13043	.28539	.50831	.60901	.67425
30	.00014	.00090	.00839	.05243	.13794	.30224	.54246	.65329	.72435
40	.00018	.00097	.00837	.05207	.14063	.31516	.57994	.70689	.78792
50	.00019	.00095	.00779	.04886	.13615	.31458	.59818	.73762	.82657
70	.00020	.00086	.00655	.04143	.12150	.30093	.60888	.76895	.87067
100	.00020	.00075	.00520	.03304	.10123	.27167	.60150	.78585	.90291
140	.00018	.00065	.00411	.02554	.08068	.23486	.57746	.78805	.92313
200	.00017	.00055	.00334	.01981	.06293	.19201	.53330	.77588	.93636
300	.00015	.00046	.00259	.01518	.04734	.14904	.46527	.74316	.94373
500	.00014	.00038	.00195	.01109	.03391	.10704	.36461	.66619	.94360
1000	.00012	.00028	.00143	.00786	.02432	.07358	.24855	.50973	.92141
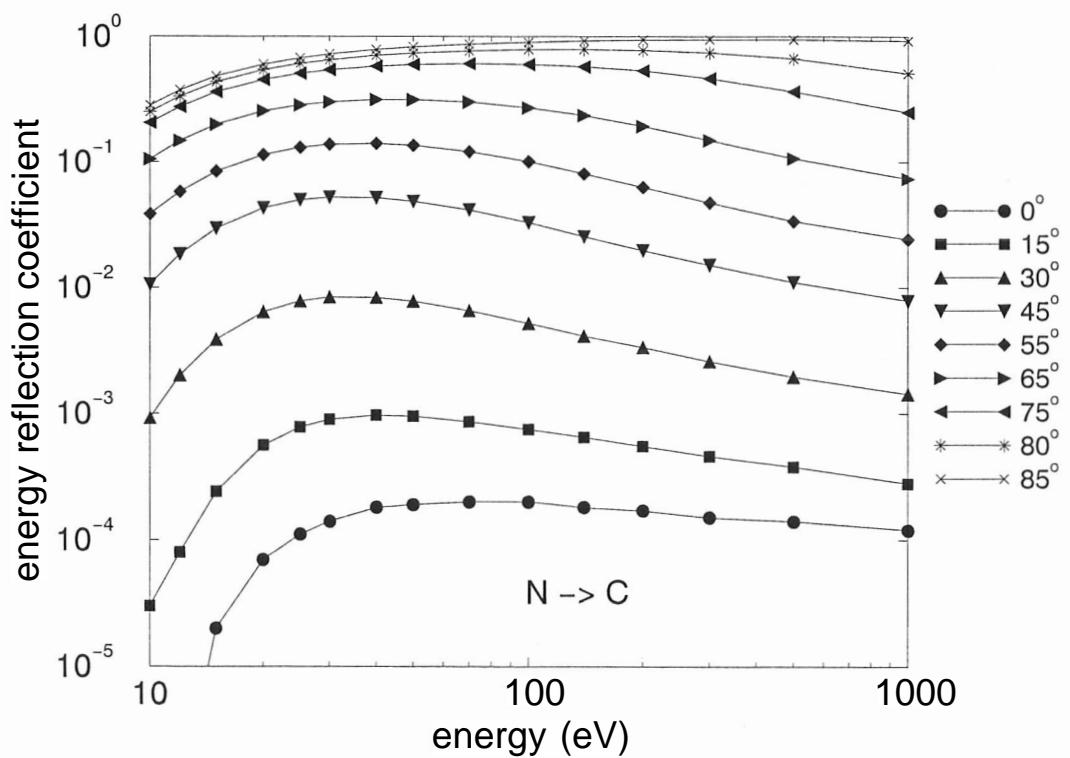
Average depth of implanted N in C

z1= 7 , m1= 14.01 . z2= 6 , m2= 12.01 . Es=7.41 . rho=1.85 g/cm**3 ; ne=15, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	1.2	1.1	0.9	0.6	0.5	0.3	0.2	0.1	0.1
12	1.4	1.3	1.1	0.8	0.6	0.4	0.2	0.2	0.1
15	1.7	1.6	1.3	1.0	0.8	0.5	0.3	0.2	0.2
20	2.2	2.0	1.8	1.4	1.1	0.8	0.5	0.4	0.3
25	2.6	2.5	2.2	1.7	1.3	1.0	0.5	0.3	0.2
30	3.1	2.9	2.5	2.1	1.7	1.2	0.8	0.7	0.5
40	3.8	3.6	3.2	2.6	2.3	1.8	1.2	0.9	0.6
50	4.5	4.3	3.6	3.2	2.7	2.2	1.5	1.1	0.9
70	5.7	5.5	4.6	4.2	3.6	3.0	2.1	1.6	1.1
100	7.4	7.1	6.0	5.4	4.7	4.0	3.0	2.4	1.6
140	9.4	9.0	8.2	6.9	6.0	5.1	4.0	3.3	2.2
200	12.0	11.6	10.5	8.9	7.7	6.6	5.4	4.6	3.2
300	16.0	15.5	14.0	11.8	10.2	8.7	7.3	6.4	4.8
500	23.2	22.4	20.2	17.1	14.8	12.6	10.6	9.5	7.6
1000	39.4	38.0	34.4	28.9	25.0	21.0	17.6	16.2	13.9
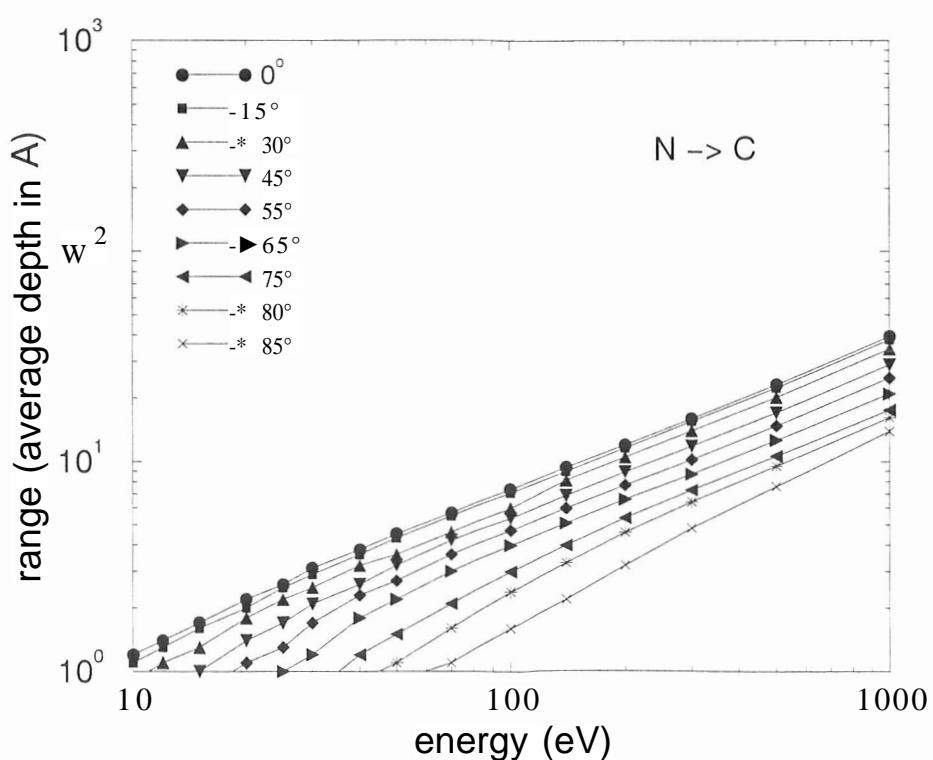
Sputter yield of C by Ne
z1=10 , m1= 20.18 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=12, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00000	.00000	.00004	.00007	.00006	.00002	.00001	.00000
25	.00000	.00000	.00002	.00020	.00035	.00052	.00026	.00006	.00000
30	.00000	.00000	.00010	.00067	.00164	.00263	.00109	.00023	.00000
40	.00000	.00005	.00069	.00510	.01194	.01530	.00510	.00097	.00002
50	.00003	.00025	.00299	.01716	.03351	.03647	.01214	.00238	.00004
70	.00046	.00212	.01471	.06089	.09954	.10510	.03796	.00673	.00010
100	.00325	.00987	.04629	.14680	.22730	.23560	.08826	.01733	.00022
140	.01180	.02694	.09444	.25590	.39300	.42090	.17520	.03811	.00047
200	.03029	.05611	.16020	.38650	.59120	.66310	.32610	.08212	.00104
300	.06498	.10330	.24550	.54560	.83190	.99160	.60410	.17980	.00272
500	.12630	.17980	.36070	.74320	1.13300	1.47000	1.15100	.45930	.00991
1000	.23160	.29860	.52360	.99780	1.50600	2.09000	2.17400	1.30800	.06378
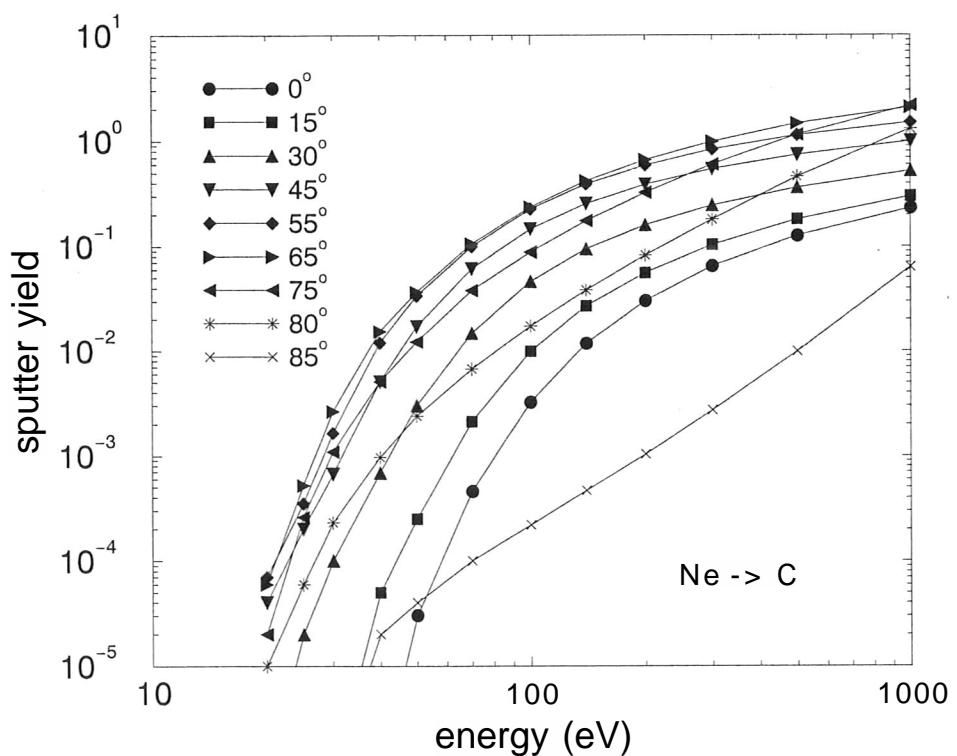
Sputtered energy of C by Ne

zl=10 . ml= 20.18 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 : ne=12, na=9

Eq(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00000	.00000	.00000	.00001	.00001	.00000	.00000	.00000
25	.00000	.00000	.00000	.00002	.00004	.00008	.00005	.00001	.00000
30	.00000	.00000	.00001	.00007	.00023	.00045	.00022	.00005	.00000
40	.00000	.00000	.00005	.00064	.00196	.00313	.00118	.00023	.00000
50	.00000	.00001	.00026	.00230	.00581	.00789	.00305	.00060	.00001
70	.00002	.00012	.00130	.00834	.01735	.02319	.00982	.00172	.00002
100	.00013	.00053	.00381	.01852	.03701	.04847	.02185	.00425	.00004
140	.00043	.00134	.00698	.02842	.05590	.07650	.04018	.00849	.00007
200	.00102	.00246	.01044	.03658	.07112	.10140	.06448	.01656	.00013
300	.00195	.00396	.01349	.04229	.07955	.11970	.09741	.03133	.00029
500	.00312	.00551	.01581	.04540	.08228	.13110	.13460	.06333	.00092
1000	.00424	.00671	.01657	.04325	.07794	.12730	.16350	.11820	.00553
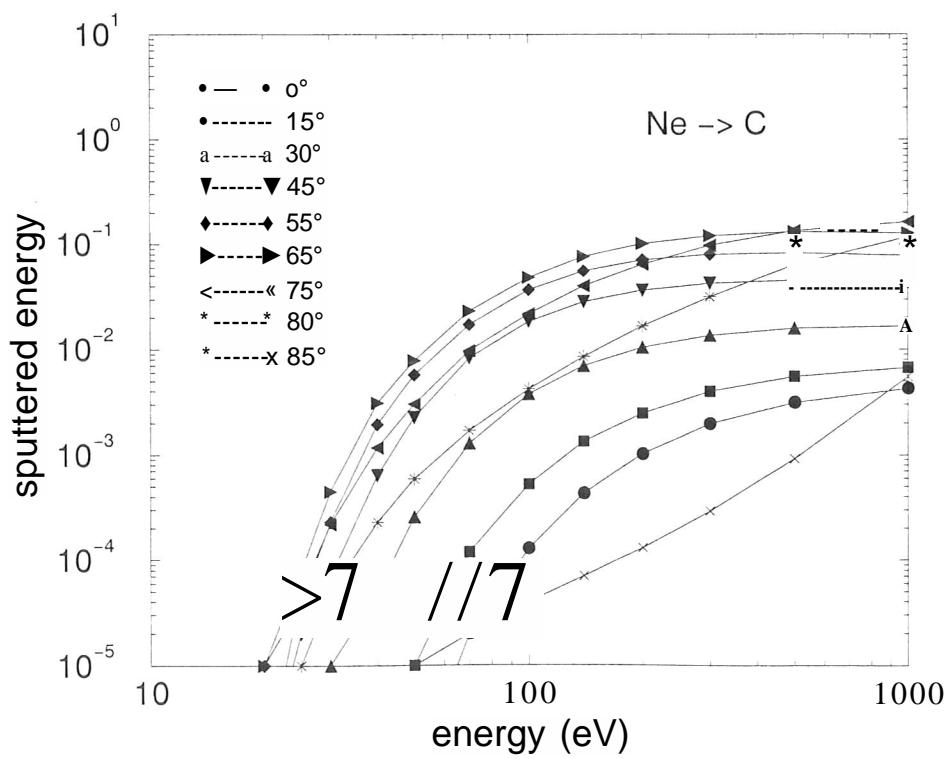
Particle reflection coefficient of Ne by C

zl=10 , ml= 20.18 , z2= 6 , m2= 12.01 , Es=7.41   , rho=1.85 g/cm**3 ; ne—14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.01309	.03119	.11492	.35349	.59362	.83696	.97661	.99700	.99998
15	.00545	.01784	.08985	.32216	.57036	.82886	.97733	.99737	.99999
20	.00310	.01282	.07664	.30062	.55072	.81884	.97701	.99749	.99999
25	.00217	.01030	.06785	.28181	.53190	.80800	.97611	.99753	1.00000
30	.00172	.00869	.06104	.26545	.51408	.79685	.97469	.99750	.99999
40	.00131	.00686	.05094	.23564	.47929	.77174	.97114	.99735	.99999
50	.00111	.00573	.04386	.21211	.44770	.74788	.96728	.99697	.99999
70	.00086	.00453	.03499	.17529	.39526	.69939	.95663	.99626	.99999
100	.00072	.00348	.02591	.13916	.32877	.63508	.93804	.99425	.99999
140	.00065	.00274	.01990	.10867	.26918	.56281	.90806	.99071	.99998
200	.00060	.00227	.01565	.08316	.21724	.48218	.86322	.98304	.99997
300	.00050	.00198	.01260	.06434	.16802	.39249	.78811	.96429	.99994
500	.00046	.00158	.00935	.04740	.12622	.29776	.66640	.91063	.99969
1000	.00037	.00127	.00709	.03377	.09077	.21443	.50050	.77390	.99628
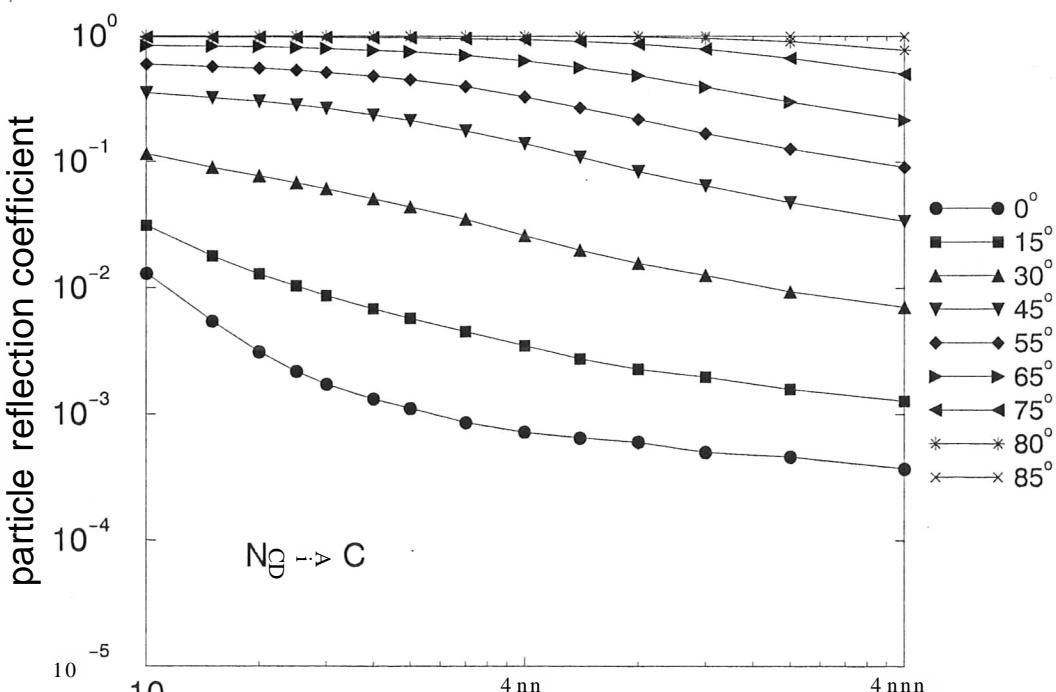
Energy reflection coefficient of Ne by C
$zl=10$, $ml=20.18$, $z2=6$. $m2=12.01$, $Es=7.41$, $rho=1.85$ g/cm**3 ; $ne=14$. $na=9$

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00001	.00024	.00397	.03401	.10752	.27269	.54273	.69767	.83334
15	.00002	.00029	.00442	.03781	.11732	.29226	.57632	.73175	.86730
20	.00003	.00031	.00443	.03882	.12129	.30209	.59633	.75406	.88736
25	.00003	.00029	.00427	.03834	.12199	.30682	.60907	.76949	.90095
30	.00003	.00027	.00401	.03722	.12123	.30837	.61737	.78059	.90982
40	.00002	.00022	.00343	.03394	.11586	.30445	.62666	.79516	.92250
50	.00002	.00018	.00291	.03054	.10905	.29806	.62881	.80377	.93099
70	.00001	.00013	.00221	.02464	.09579	.27982	.62536	.81232	.94125
100	.00001	.00009	.00150	.01877	.07663	.25020	.60919	.81421	.94916
140	.00001	.00007	.00104	.01343	.05968	.21570	.58297	.80911	.95413
200	.00001	.00005	.00076	.00966	.04462	.17676	.54036	.79423	.95713
300	.00001	.00004	.00059	.00677	.03148	.13295	.47322	.76224	.95799
500	.00001	.00004	.00040	.00448	.02082	.08998	.37185	.68980	.95482
1000	.00001	.00003	.00032	.00308	.01360	.05679	.21436	.53625	.93700
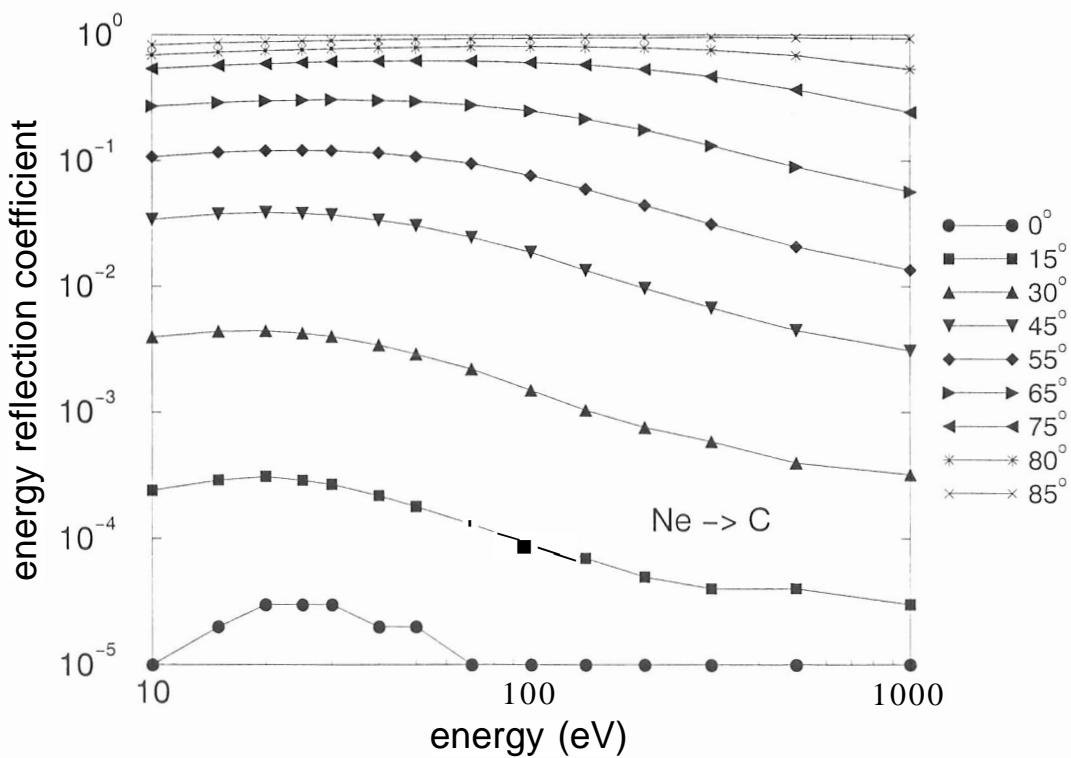
Average depth of implanted Ne in C

$zl=10$, $ml=20.18$, $z2=6$, $m2=12.01$, $Es=7.41$, rho=1.85 g/cm**3 ; ne=14, na=9

| Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	1.1	1.0	0.9	0.8	0.7	0.6	0.4	0.3	0.2
15	1.6	1.5	1.3	1.1	1.0	0.8	0.6	0.4	0.2
20	2.1	2.0	1.7	1.4	1.2	1.0	0.7	0.5	0.3
25	2.5	2.4	2.1	1.7	1.5	1.2	0.8	0.6	0.3
30	2.9	2.8	2.4	2.0	1.7	1.4	1.0	0.7	0.3
40	3.6	3.5	3.0	2.5	2.1	1.7	1.2	0.9	0.5
50	4.3	4.1	3.6	3.0	2.5	2.1	1.5	1.2	0.7
70	5.5	5.3	4.6	3.8	3.2	2.7	2.0	1.5	1.0
100	7.0	6.7	6.0	4.9	4.2	3.5	2.7	2.3	1.5
140	8.8	8.5	7.5	6.2	5.3	4.4	3.5	2.8	2.1
200	11.2	10.7	9.6	7.9	6.7	5.6	4.5	3.8	2.8
300	14.6	14.0	12.5	10.3	8.9	7.4	6.0	5.2	3.9
500	20.6	19.8	17.8	14.7	12.4	10.3	8.5	7.7	6.0
1000	33.4	32.3	28.9	23.9	20.3	16.7	13.8	12.2	10.4
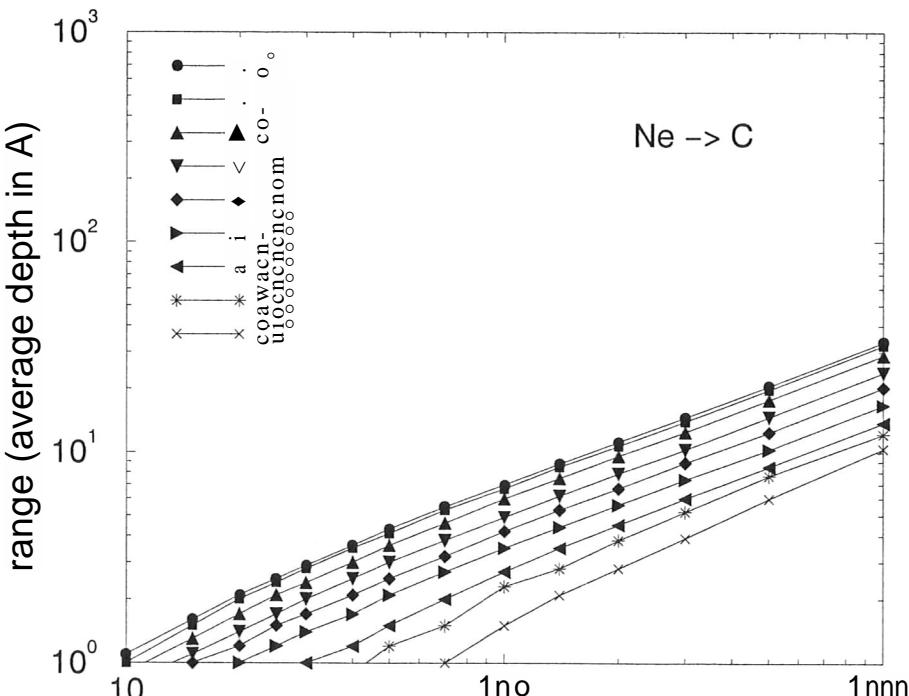
Sputtering yield of C by Ar
zl=18 , ml= 39.95 , z2= 6 , m'2= 12.01 , Es=7.41 . rho=1.85 g/cm**3 : ne=ll, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
25	.00000	.00000	.00000	.00002	.00005	.00004	.00002	.00000	.00000
30	.00000	.00000	.00000	.00010	.00019	.00023	.00013	.00004	.00000
40	.00000	.00000	.00008	.00067	.00175	.00340	.00177	.00037	.00001
50	.00000	.00002	.00042	.00320	.00855	.01167	.00649	.00133	.00002
70	.00007	.00037	.00354	.02001	.04566	.06108	.02648	.00531	.00009
100	.00083	.00298	.01758	.07250	.14020	.17790	.07666	.01604	.00027
140	.00462	.01181	.04904	.16280	.29860	.37620	.17170	.03936	.00066
200	.01656	.03342	.10540	.29430	.52080	.67530	.34610	.08677	.00153
300	.04538	.07573	.19280	.47040	.81320	1.10400	.67260	.19640	.00394
500	.10940	.15960	.33420	.72200	1.19400	1.73100	1.34300	.49590	.01313
1000	.24670	.32110	.56840	1.09300	1.72300	2.61900	2.75200	1.45900	.06939
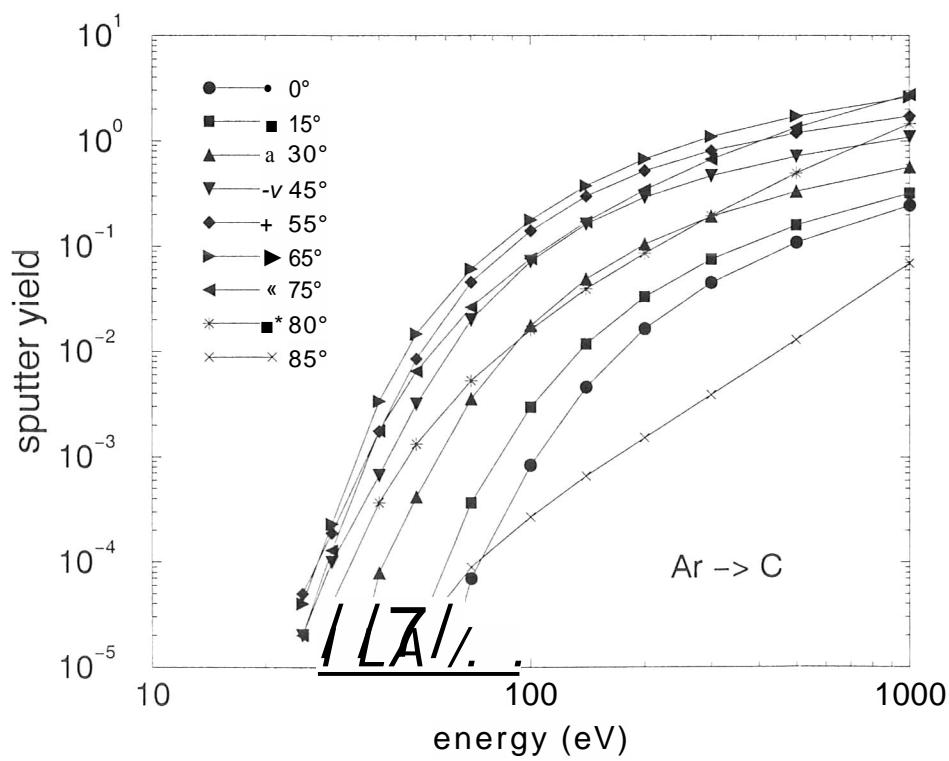
Sputtered energy of C by Ar
zl=18 , ml= 39.95 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=10, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
30	.00000	.00000	.00000	.00001	.00002	.00002	.00002	.00001	.00000
40	.00000	.00000	.00000	.00005	.00017	.00042	.00027	.00006	.00000
50	.00000	.00000	.00002	.00028	.00097	.00208	.00111	.00023	.00000
70	.00000	.00001	.00022	.00195	.00558	.00949	.00483	.00097	.00001
100	.00003	.00013	.00113	.00698	.01694	.02735	.01417	.00286	.00003
140	.00014	.00048	.00299	.01445	.03333	.05371	.03008	.00672	.00007
200	.00047	.00125	.00580	.02296	.05046	.08383	.05505	.01378	.00014
300	.00115	.00249	.00921	.03114	.06537	.11170	.09008	.02769	.00031
500	.00232	.00428	.01283	.03773	.07422	.13120	.13610	.05749	.00088
1000	.00391	.00630	.01574	.04133	.07596	.13540	.18330	.11750	.00428
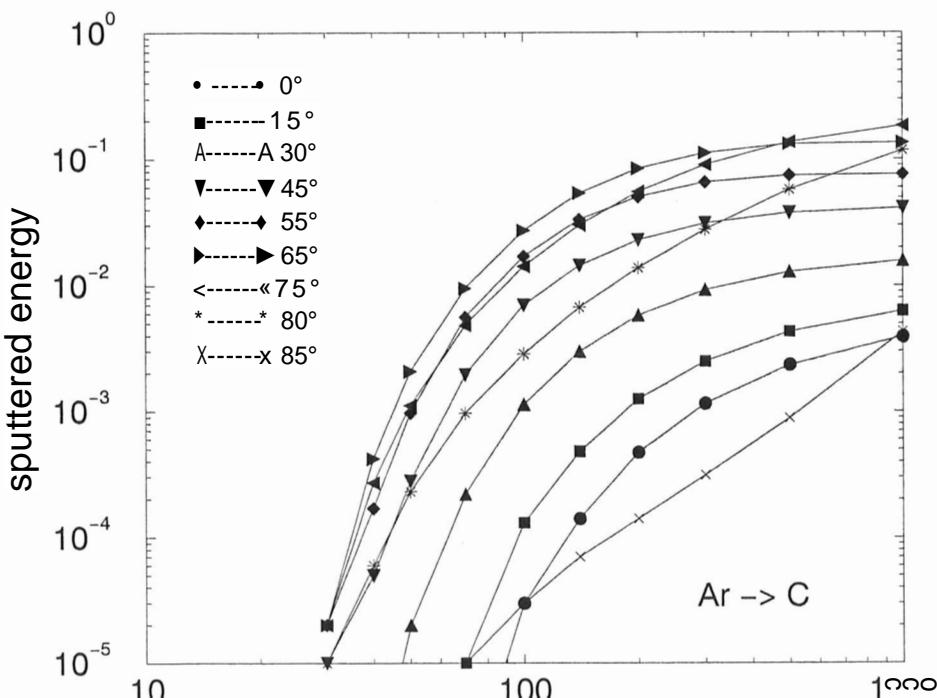
Ar -> C

Particle reflection coefficient of Ar by C

z1=18 . m1= 39.95 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 ; ne=14. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00028	.00867	.11407	.36909	.74159	.96993	.99699	0.99999
15	.00000	.00005	.00543	.10111	.35640	.74039	.97273	.99765	0.99999
20	.00000	.00003	.00427	.09358	.34839	.73686	.97334	.99790	1.00000
25	.00000	.00003	.00375	.08822	.33766	.72968	.97356	.99800	1.00000
30	.00000	.00003	.00341	.08299	.32718	.72152	.97303	.99804	1.00000
40	.00000	.00003	.00284	.07323	.30464	.70125	.97066	.99802	1.00000
50	.00000	.00002	.00235	.06444	.28217	.67933	.96717	.99781	1.00000
70	.00000	.00002	.00166	.05007	.24168	.63400	.95824	.99724	1.00000
100	.00000	.00001	.00111	.03611	.19390	.57097	.94285	.99602	1.00000
140	.00000	.00001	.00085	.02557	.14873	.49973	.91863	.99339	.99999
200	.00000	.00001	.00060	.01775	.10942	.41309	.87711	.98828	.99999
300	.00000	.00001	.00045	.01278	.07679	.32090	.80892	.97551	.99997
500	.00000	.00001	.00035	.00891	.05097	.22433	.68827	.93790	.99986
1000	.00000	.00000	.00026	.00586	.03154	.14178	.49726	.82163	.99840
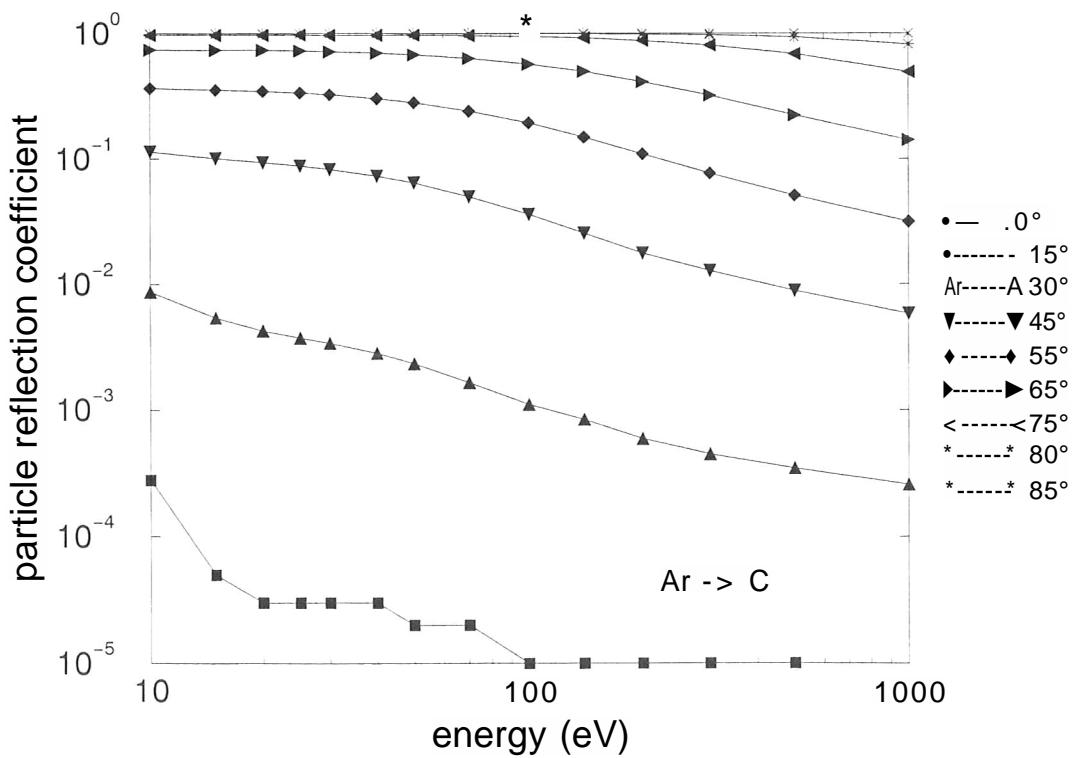
Energy reflection coefficient of Ar by C
z1=18 , m1= 39.95 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cni**3 ; ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00006	.00406	.03246	.15214	.43284	.61485	.79499
15	.00000	.00000	.00008-	.00474	.03653	.16669	.46402	.64898	.82527
20	.00000	.00000	.00009	.00497	.03846	.17457	.48293	.67217	.84450
25	.00000	.00000	.00009	.00499	.03902	.17875	.49652	.68846	.85776
30	.00000	.00000	.00008	.00485	.03883	.18075	.50597	.70066	.86784
40	.00000	.00000	.00007	.00439	.03725	.18048	.51750	.71782	.88313
50	.00000	.00000	.00005	.00387	.03499	.17756	.52338	.72890	.89396
70	.00000	.00000	.00004	.00294	.03000	.16757	.52533	.74151	.90795
100	.00000	.00000	.00002	.00197	.02353	.15041	.51850	.74908	.91967
140	.00000	.00000	.00001	.00126	.01712	.12983	.50077	.74922	.92810
200	.00000	.00000	.00001	.00074	.01167	.10294	.46946	.74154	.93424
300	.00000	.00000	.00001	.00046	.00709	.07393	.41778	.71885	.93794
500	.00000	.00000	.00000	.00028	.00386	.04487	.33210	.66439	.93748
1000	.00000	.00000	.00000	.00016	.00191	.02254	.20772	.53521	.92469
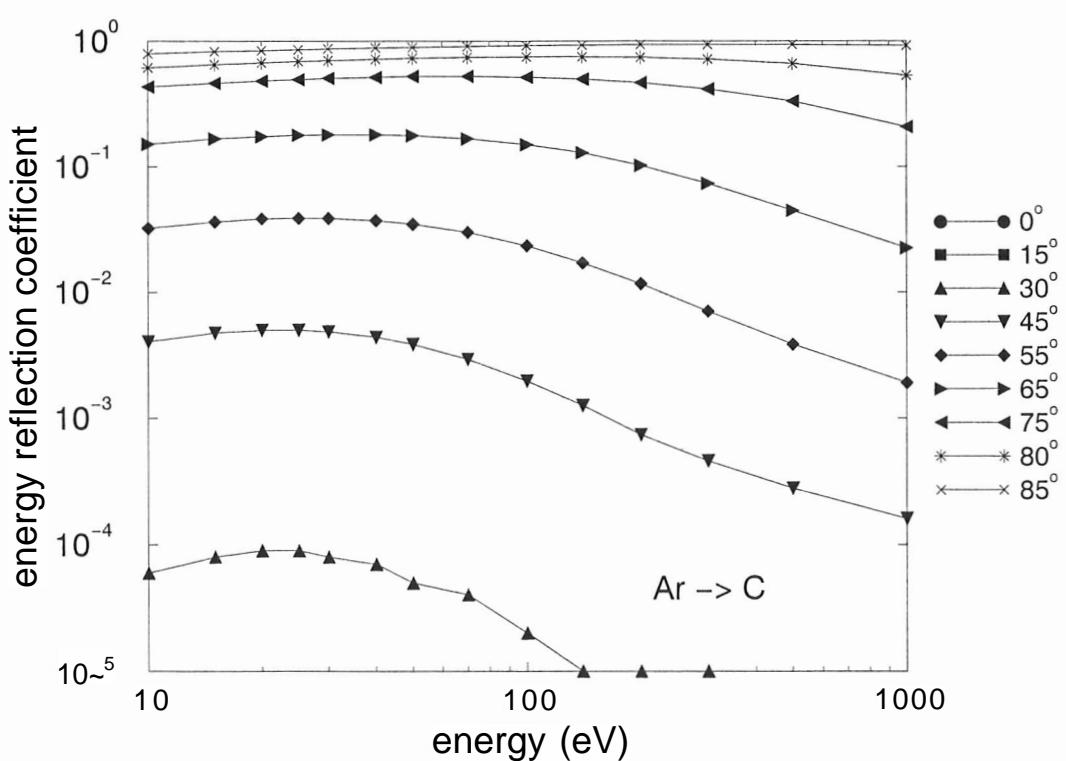
Average depth of implanted Ar in C

z1= 18 , m1= 39.95 , z2= 6 , m2= 12.01 , Es=7.41 , rho=1.85 g/cm**3 : ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	1.3	1.3	1.1	0.9	0.8	0.6	0.5	0.4	0.2
15	2.0	1.9	1.7	1.3	1.1	0.8	0.6	0.5	0.3
20	2.6	2.5	2.1	1.6	1.3	1.0	0.8	0.6	0.5
25	3.1	3.0	2.6	2.0	1.6	1.2	0.9	0.7	0.5
30	3.6	3.5	3.0	2.2	1.8	1.4	1.1	0.9	0.6
40	4.5	4.3	3.7	2.8	2.2	1.7	1.3	1.1	0.8
50	5.2	5.0	4.3	3.3	2.6	2.0	1.6	1.3	0.9
70	6.5	6.2	5.4	4.1	3.3	2.6	2.0	1.7	1.1
100	8.1	7.8	6.8	5.2	4.2	3.3	2.5	2.2	1.7
140	LO.O	9.6	8.4	6.5	5.2	4.1	3.2	2.7	2.3
200	12.3	11.8	10.4	8.2	6.5	5.1	4.0	3.4	2.8
300	15.6	15.0	13.2	10.5	8.4	6.6	5.2	4.5	3.5
500	21.0	20.2	17.9	14.3	11.5	9.0	7.0	6.2	5.4
1000	31.6	30.5	27.2	21.9	17.8	13.8	10.6	9.4	7.2
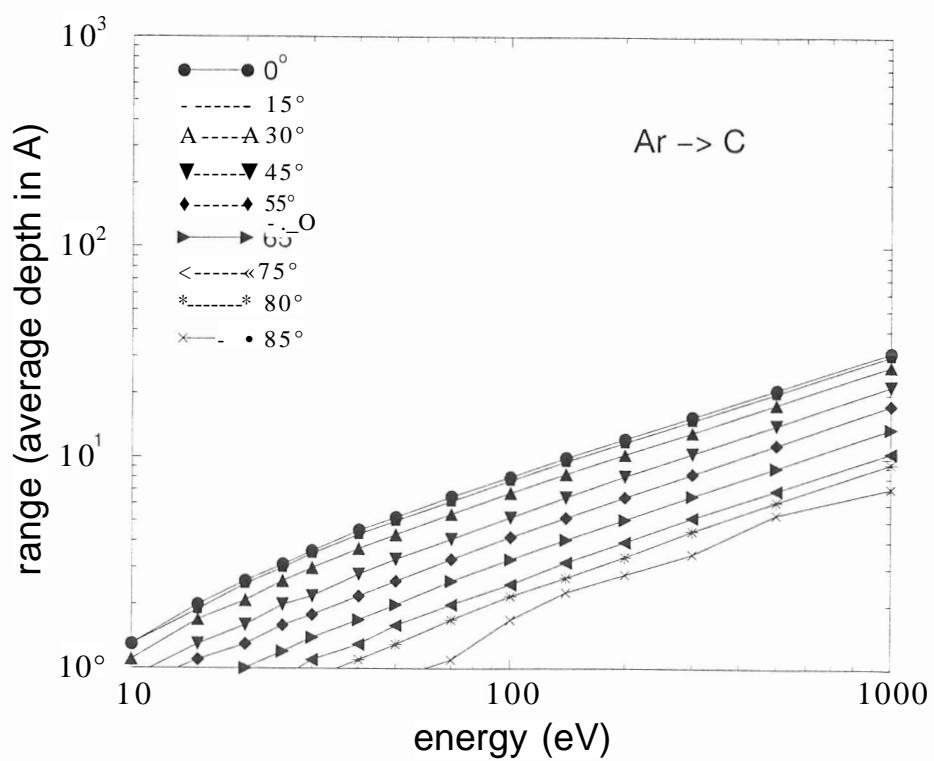
Sputter yield of W by H

$z1= 1$, $m1= 1.01$, $z2=74$, $m2=183.85$, $Es=8.68$, $rho=19.29$ g/cm**3 ; $ne= 7$, $na=9$

Eq(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
500	.00001	.00001	.00001	.00002	.00002	.00002	.00001	.00001	.00000
550	.00004	.00004	.00005	.00006	.00006	.00006	.00004	.00002	.00000
600	.00009	.00009	.00010	.00012	.00013	.00013	.00010	.00006	.00001
700	.00024	.00026	.00029	.00030	.00034	.00034	.00028	.00019	.00004
800	.00042	.00046	.00052	.00057	.00063	.00069	.00058	.00039	.00010
900	.00067	.00067	.00074	.00084	.00096	.00102	.00093	.00069	.00021
1000	.00086	.00090	.00099	.00109	.00124	.00149	.00144	.00114	.00039
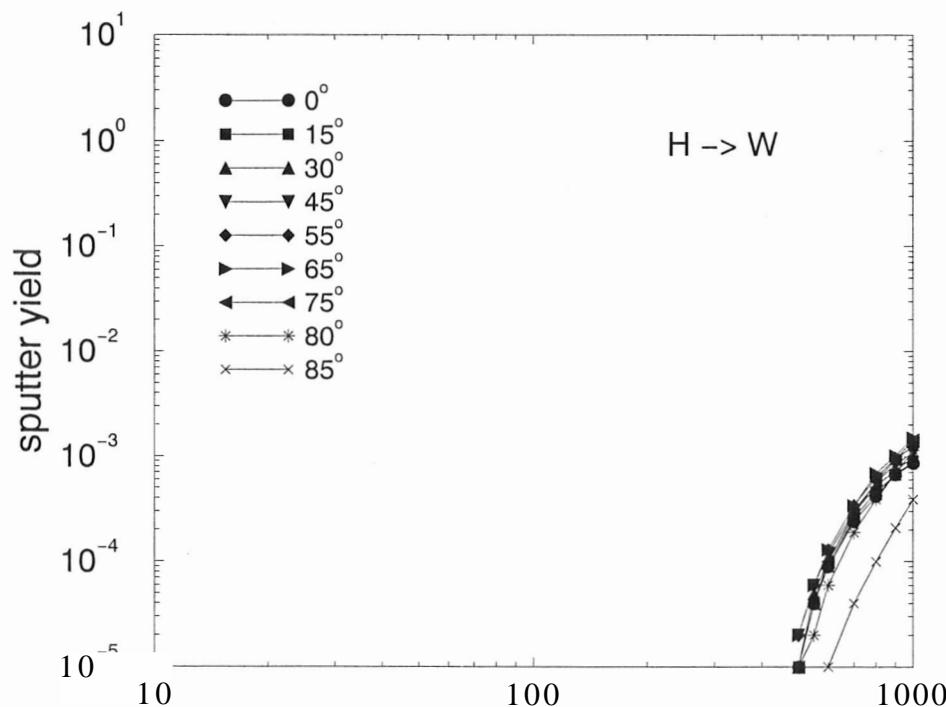
Sputtered energy of W by H

z1= 1 , m1= 1.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne= 1. na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
1000	.00000	.00000	.00000	.00000	.00001	.00001	.00001	.00001	.00000

Particle reflection coefficient of 11 by W

zl= 1 , ml= 1.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.75777	.76650	.79255	.83991	.88007	.92171	.95939	.97208	.97966
20	.71666	.72868	.75192	.80466	.85122	.90366	.95715	.97708	.98836
50	.66772	.67719	.70517	.75108	.79683	.85918	.93714	.97318	.99301
100	.63196	.64059	.66663	.71503	.75583	.81697	.90574	.95842	.99328
200	.59439	.60537	.62928	.67531	.71912	.77472	.86115	.92866	.98988
300	.57145	.57995	.60933	.65479	.69741	.75366	.83545	.90430	.98499
500	.53894	.54856	.57728	.62487	.66846	.72353	.80295	.86947	.97229
550	.53245	.54213	.57075	.61897	.66241	.71813	.79686	.86258	.96886
600	.52665	.53609	.56446	.61366	.65743	.71323	.79157	.85665	.96541
700	.51513	.52504	.55480	.60358	.64836	.70438	.78224	.84588	.95845
800	.50455	.51498	.54467	.59494	.63968	.69609	.77431	.83661	.95144
900	.49486	.50585	.53584	.58646	.63204	.68921	.76635	.82842	.94466
1000	.48733	.49703	.52731	.57821	.62450	.68311	.76032	.82124	.93796

H -> W
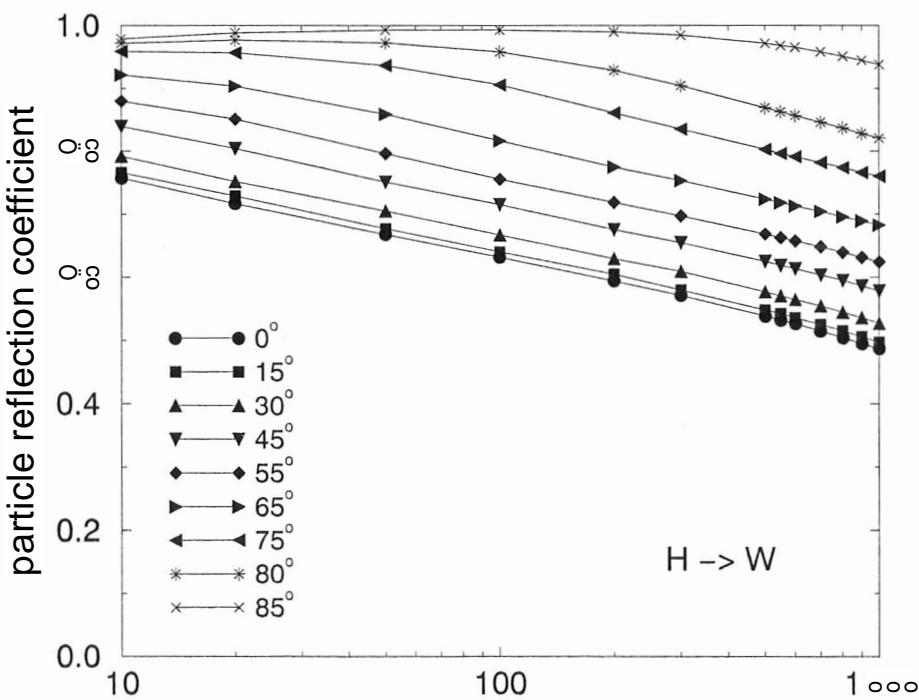
Energy reflection coefficient of H by W

$z1= 1$, $m1= 1.01$, $z2=74$, $m2=183.85$, $Es=8.68$, $rho=19.29$ g/cm**3 ; $ne=13$, $na=9$

| Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.56352	.57706	.61462	.68329	.74460	.81303	.88042	.90523	.92121
20	.51304	.52715	.56200	.63392	.70435	.78956	.88385	.92270	.94672
50	.45133	.46254	.49705	.55882	.62463	.72096	.85323	.92043	.96235
100	.40995	.41925	.44969	.50930	.56688	.65572	.80128	.89546	.96522
200	.36977	.38066	.40765	.46162	.51640	.59580	.72992	.84521	.96002
300	.34701	.35540	.38424	.43666	.48865	.56403	.69022	.80509	.95111
500	.31630	.32528	.35335	.40393	.45438	.52547	.64179	.74966	.92857
550	.31014	.31934	.34718	.39762	.44787	.51871	.63305	.73888	.92268
600	.30504	.31383	.34126	.39210	.44208	.51248	.62541	.72965	.91673
700	.29483	.30406	.33185	.38166	.43190	.50142	.61220	.71306	.90488
800	.28589	.29485	.32260	.37315	.42270	.49184	.60110	.69895	.89322
900	.27785	.28689	.31440	.36447	.41420	.48333	.59062	.68659	.88178
1000	.27127	.27979	.30717	.35664	.40664	.47596	.58218	.67600	.87088
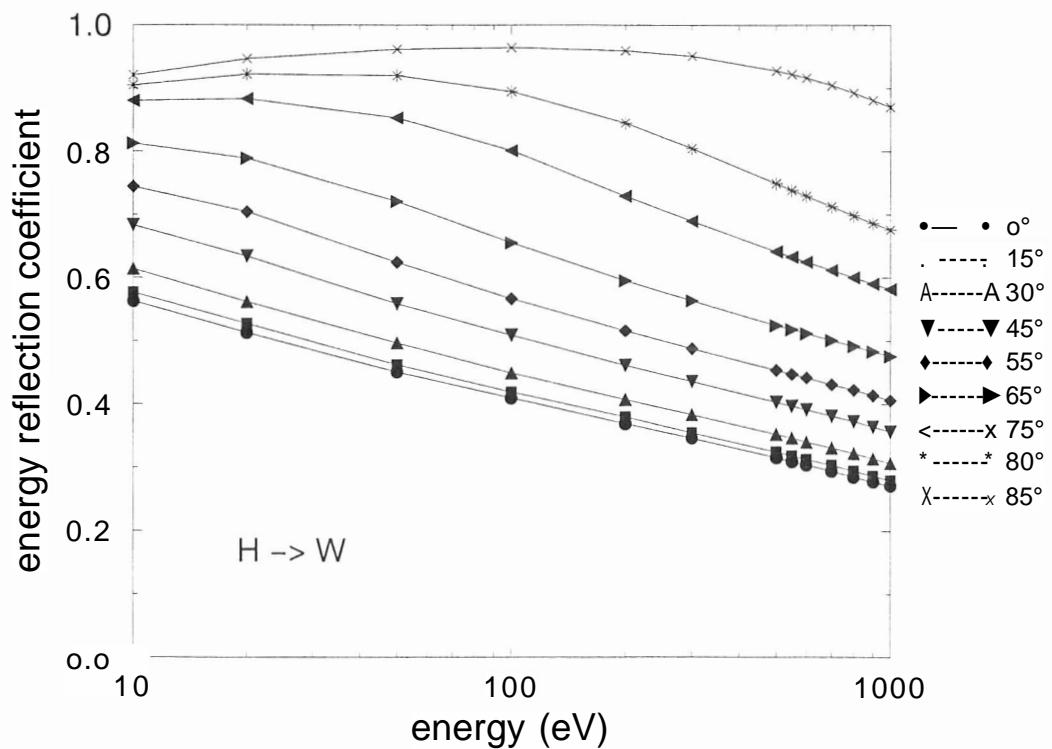
Average depth of implanted H in W

z1= 1 , m1= 1.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	13.0	12.9	12.9	12.8	12.7	12.7	12.5	12.5	12.5
20	18.2	18.2	18.2	18.0	17.9	17.7	17.6	17.7	17.6
50	28.6	28.6	28.5	28.3	28.0	28.0	27.7	27.6	27.5
100	40.9	40.6	40.4	40.1	39.7	39.3	39.0	39.0	39.0
200	58.5	58.1	57.6	57.0	56.2	56.1	55.7	55.2	55.1
300	72.7	72.7	71.6	70.8	70.1	69.4	68.5	68.6	68.5
500	96.3	95.9	94.9	93.3	92.3	91.2	90.4	90.0	90.0
550	101.8	101.3	100.1	98.4	97.3	96.1	95.1	94.9	94.9
600	106.9	106.4	105.2	103.4	102.1	100.8	99.8	99.4	99.3
700	116.9	116.3	114.8	112.9	111.3	109.9	108.7	108.3	108.3
800	126.4	125.7	124.1	122.0	120.2	118.5	117.3	116.8	116.8
900	135.6	134.9	133.2	130.4	128.6	126.9	125.3	125.0	124.6
1000	144.2	143.5	141.7	138.9	136.8	134.8	133.0	132.6	132.5
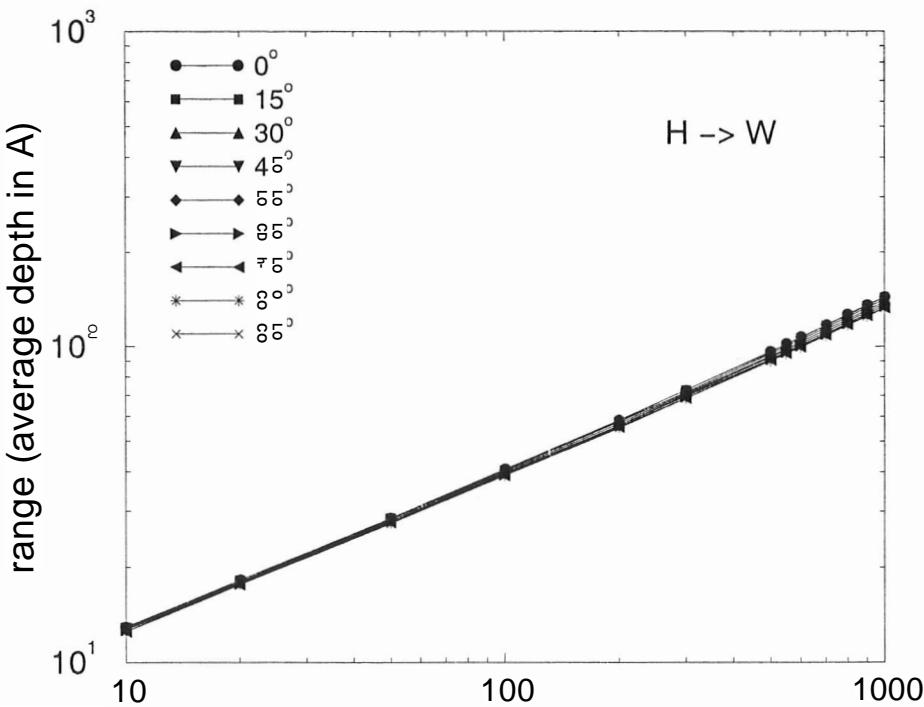
Sputter yield of W by D

z1= 1 , m1= 2.01 , z2=74 . m2=183.85   , Es=8.68 , rho=19.29 g/cm**3 : ne= 9. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
250	.00002	.00002	.00002	.00003	.00003	.00003	.00001	.00001	.00000
270	.00008	.00008	.00008	.00010	.00010	.00009	.00006	.00002	.00000
300	.00021	.00022	.00024	.00028	.00027	.00023	.00015	.00008	.00001
350	.00060	.00060	.00068	.00073	.00079	.00075	.00048	.00026	.00004
400	.00111	.00116	.00118	.00133	.00153	.00139	.00098	.00059	.00010
500	.00220	.00232	.00249	.00274	.00293	.00308	.00250	.00172	.00036
600	.00339	.00331	.00342	.00411	.00455	.00476	.00473	.00378	.00112
700	.00422	.00414	.00484	.00523	.00638	.00710	.00742	.00692	.00252
1000	.00655	.00711	.00778	.00922	.01065	.01260	.01815	.02044	.01148

84
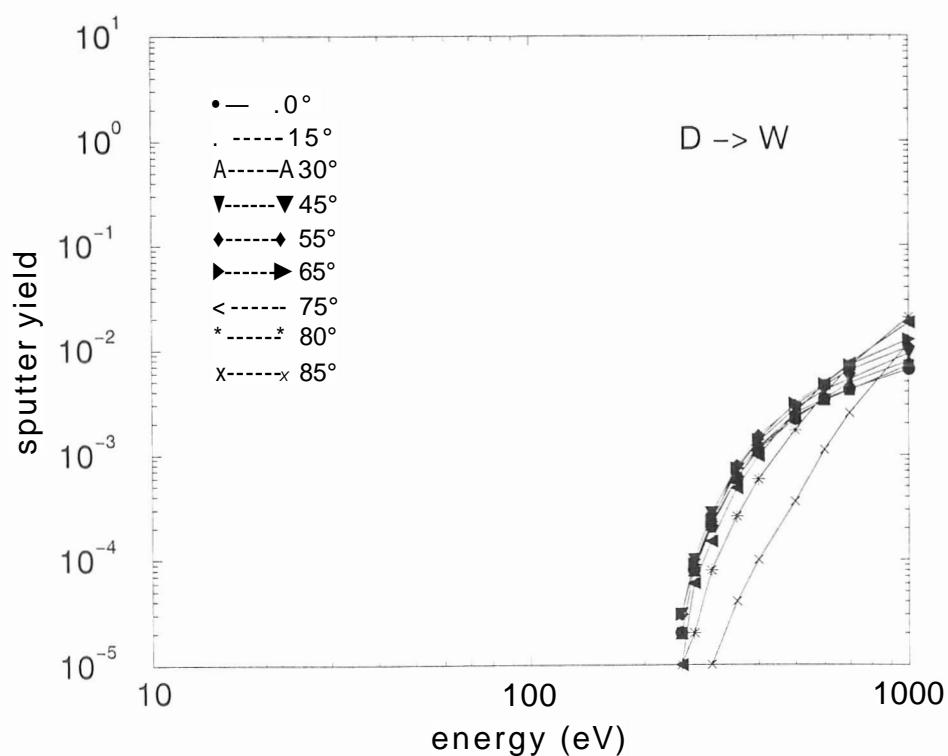
Sputtered energy of W by D

z1= 1 , m1= 2.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne= 7, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
350	.00000	.00000	.00000	.00001	.00001	.00001	.00000	.00000	.00000
400	.00001	.00001	.00001	.00001	.00001	.00001	.00001	.00000	.00000
500	.00002	.00002	.00002	.00002	.00003	.00003	.00002	.00002	.00000
600	.00003	.00003	.00003	.00004	.00004	.00004	.00004	.00004	.00001
700	.00004	.00004	.00004	.00005	.00006	.00006	.00007	.00006	.00002
1000	.00006	.00006	.00007	.00008	.00009	.00011	.00016	.00019	.00013
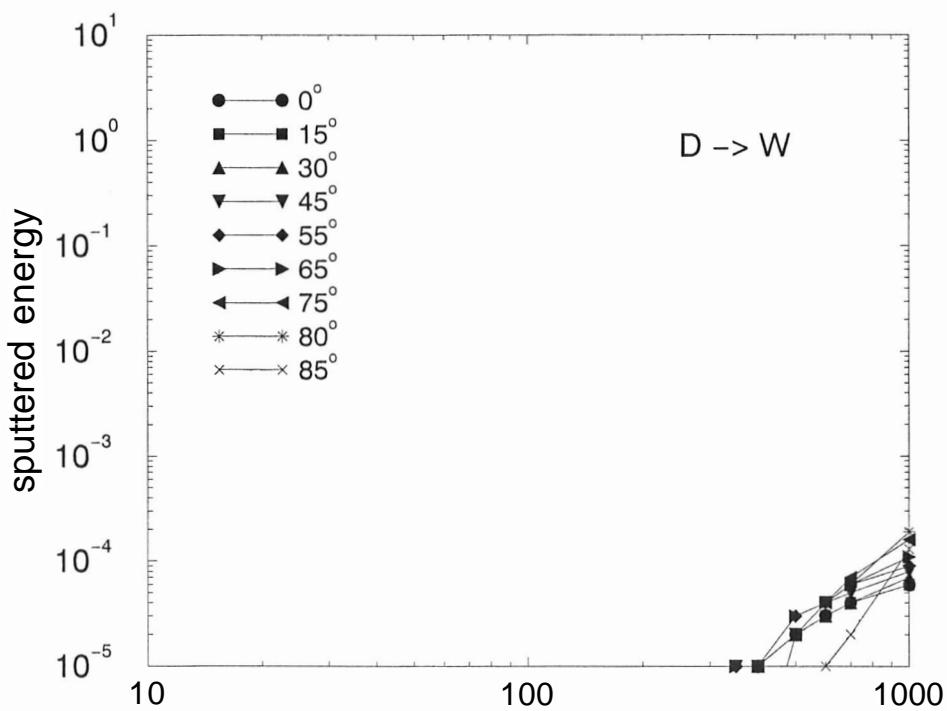
D -> W

Particle reflection coefficient of D by W

zl= 1 , ml= 2.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.76144	.77015	.79775	.84200	.88239	.92340	.96008	.97302	.98005
20	.72421	.73251	.76037	.80974	.85341	.90594	.95820	.97783	.98846
50	.67897	.68716	.71376	.75804	.80455	.86396	.93947	.97385	.99321
100	.64922	.65421	.68072	.72694	.76287	.82318	.90853	.95987	.99337
200	.61169	.62368	.64271	.68983	.73147	.78611	.86851	.93152	.99040
250	.60243	.61096	.63676	.68036	.72092	.77402	.85472	.91992	.98820
270	.59809	.60686	.63300	.67679	.71697	.77021	.85019	.91531	.98718
300	.59243	.60147	.62764	.67153	.71197	.76438	.84378	.90911	.98570
350	.58389	.59304	.61962	.66396	.70412	.75650	.83435	.89967	.98290
400	.57671	.58484	.61217	.65741	.69739	.74970	.82670	.89077	.97991
500	.56388	.57280	.60024	.64453	.68598	.73781	.81375	.87655	.97386
600	.55283	.56093	.58813	.63551	.67766	.72876	.80278	.86494	.96712
700	.54254	.55034	.57898	.62500	.66825	.72218	.79408	.85535	.96087
1000	.51736	.52832	.55700	.60501	.64556	.70255	.77373	.83270	.94195
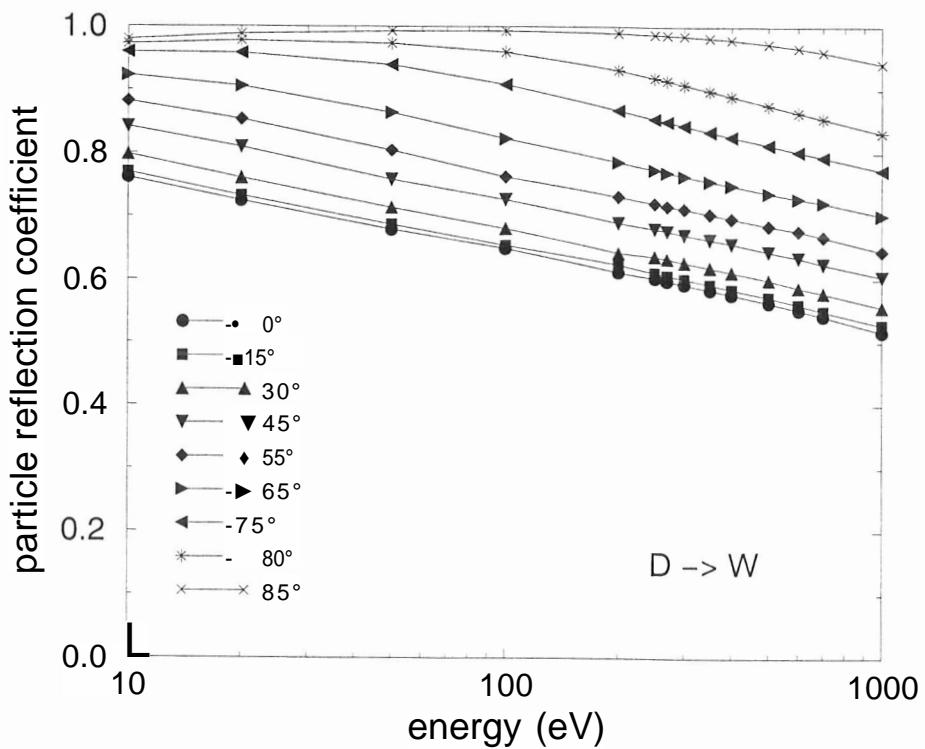
Energy reflection coefficient of D by W

zl= 1 , ml= 2.01 , z2=74 , m2=183.85 , Es=8.68   , rho=19.29 g/cm**3 ; ne=14, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.57130	.58512	.62367	.69041	.75230	.81989	.88545	.91062	.92528
20	.52450	.53607	.57417	.64413	.71239	.79781	.89011	.92810	.95088
50	.46912	.47858	.51236	.57347	.63951	.73288	.86133	.92620	.96698
100	.43338	.44164	.47079	.53041	.58331	.67160	.81231	.90350	.97004
200	.39424	.40632	.43070	.48510	.53931	.61646	.74722	.85592	.96558
250	.38365	.39282	.42145	.47306	.52501	.59963	.72621	.83664	.96179
270	.37943	.38885	.41739	.46874	.52029	.59419	.71912	.82921	.95996
300	.37400	.38340	.41162	.46278	.51380	.58660	.70920	.81901	.95731
350	.36572	.37479	.40349	.45431	.50450	.57608	.69512	.80369	.95240
400	.35882	.36706	.39589	.44651	.49605	.56742	.68365	.79005	.94724
500	.34634	.35551	.38310	.43341	.48380	.55236	.66462	.76723	.93656
600	.33613	.34446	.37257	.42307	.47294	.54072	.64895	.74900	.92529
700	.32709	.33460	.36363	.41327	.46209	.53163	.63673	.73395	.91441
1000	.30439	.31378	.34194	.39202	.43844	.50776	.60910	.70015	.88311
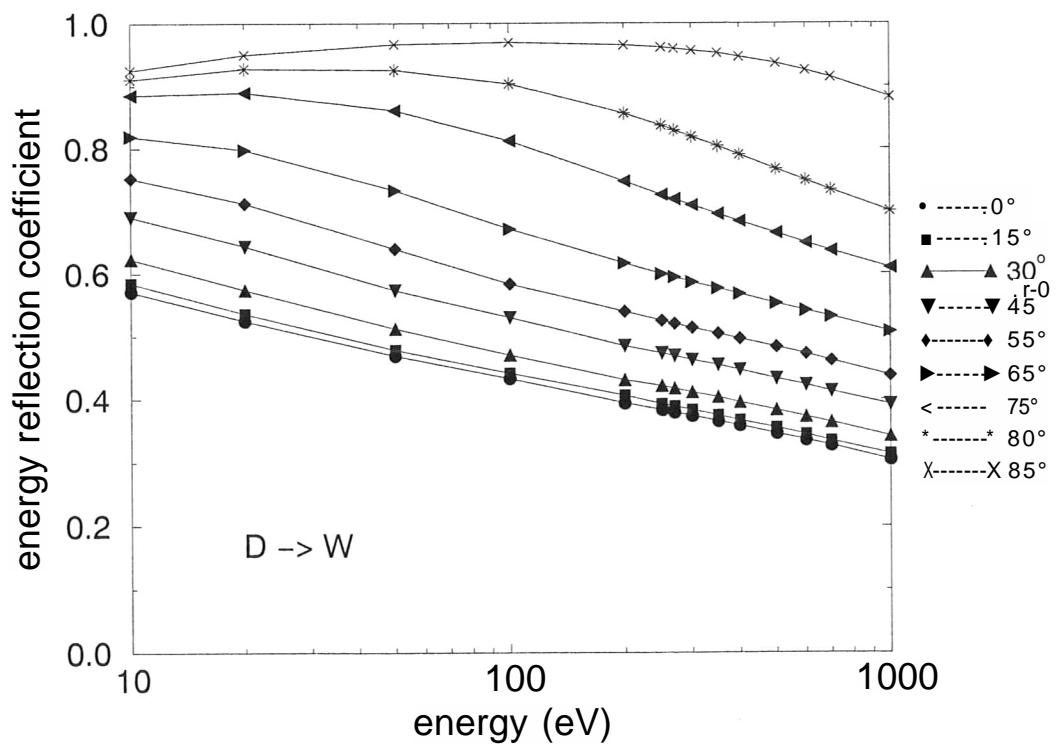
Average depth of implanted D in W

z1= 1 , m1= 2.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	13.3	13.3	13.3	13.2	13.2	13.1	13.0	13.0	12.9
20	19.0	18.9	18.9	18.7	18.6	18.6	18.4	18.4	18.2
50	30.4	30.1	30.0	29.6	29.4	29.5	29.4	28.9	29.1
100	43.7	43.2	43.1	42.3	42.1	42.0	41.8	41.5	41.9
200	63.0	62.8	62.5	61.5	61.2	60.3	60.4	59.4	59.8
250	71.1	70.9	70.3	69.5	68.9	68.3	67.8	67.7	67.6
300	78.8	78.5	77.8	76.9	76.2	75.5	74.9	74.8	74.5
350	85.8	85.6	84.9	83.8	83.1	82.3	81.7	81.4	81.2
400	92.8	92.5	91.6	90.3	89.4	88.8	87.9	87.6	87.5
500	105.6	105.2	104.2	102.6	101.9	100.7	99.8	99.6	99.4
600	117.6	117.1	115.9	114.1	113.1	111.6	110.7	110.6	110.4
700	129.1	128.6	127.1	125.1	123.9	122.0	121.2	120.9	120.6
1000	160.6	160.0	157.9	155.8	153.2	152.1	150.1	149.8	148.9
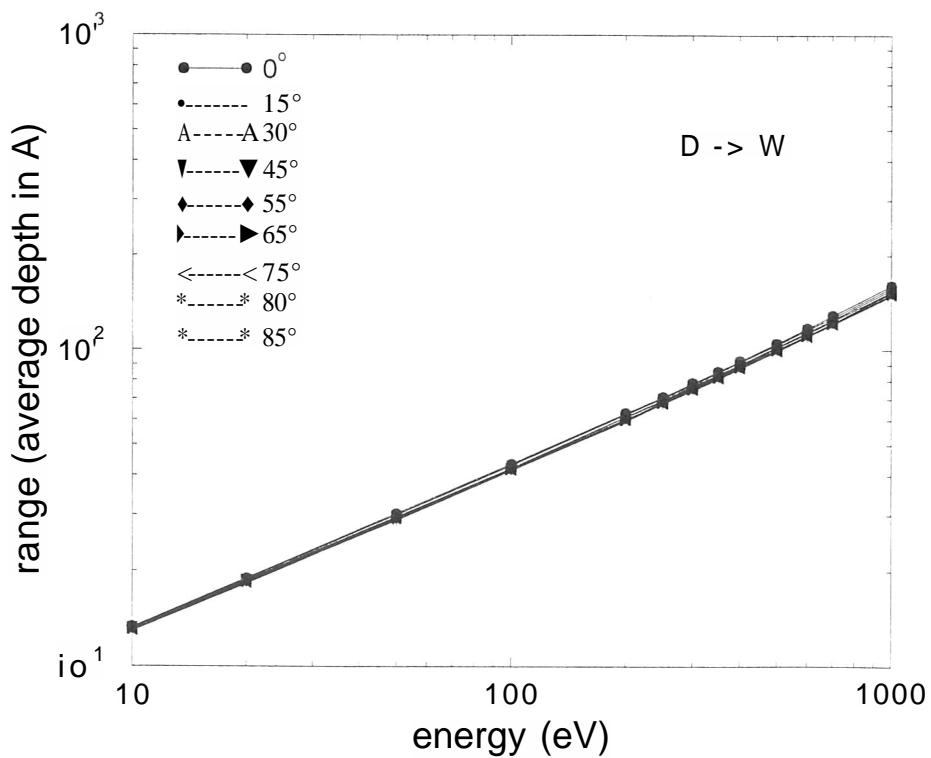
Sputter yield of W by T

$z1= 1$, $m1= 3.02$, $z2=74$, $m2=183.85$, $Es=8.68$, $rho=19.29$ g/cm**3 ; $ne=11$, $na=9$

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
160	.00001	.00001	.00001	.00001	.00001	.00001	.00000	.00000	.00000
170	.00004	.00004	.00005	.00005	.00004	.00004	.00002	.00001	.00000
180	.00010	.00010	.00011	.00012	.00011	.00009	.00005	.00002	.00000
200	.00030	.00031	.00032	.00036	.00035	.00030	.00016	.00007	.00001
250	.00123	.00129	.00128	.00146	.00145	.00134	.00079	.00042	.00005
300	.00241	.00248	.00271	.00285	.00291	.00291	.00191	.00107	.00015
400	.00489	.00491	.00517	.00590	.00664	.00673	.00597	.00398	.00091
500	.00722	.00754	.00813	.00901	.01015	.01132	.01175	.00968	.00294
700	.01111	.01078	.01254	.01455	.01688	.02037	.02666	.02701	.01247
1000	.01488	.01497	.01666	.01983	.02406	.03193	.04670	.05335	.03082
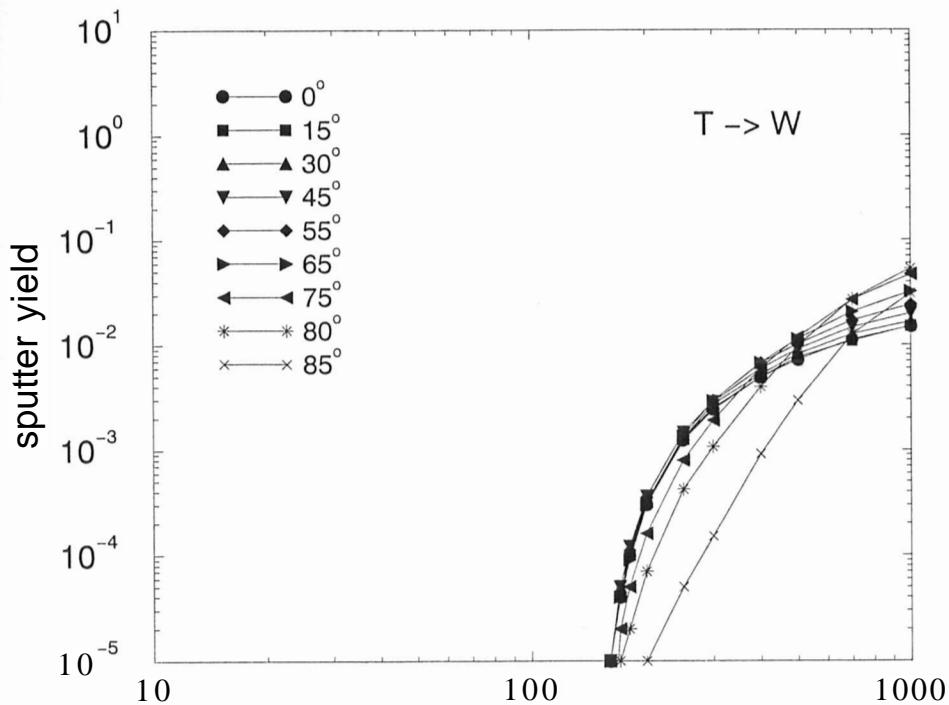
Sputtered energy of W by T

z1= 1 . m1= 3.02 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne= 7, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
250	.00001	.00001	.00001	.00002	.00002	.00001	.00001	.00000	.00000
300	.00003	.00003	.00003	.00004	.00004	.00004	.00002	.00001	.00000
400	.00007	.00007	.00007	.00008	.00009	.00010	.00008	.00005	.00001
500	.00010	.00010	.00011	.00013	.00014	.00016	.00016	.00014	.00004
700	.00015	.00015	.00017	.00020	.00023	.00027	.00035	.00039	.00020
1.000	.00017	.00018	.00020	.00023	.00029	.00038	.00059	.00072	.00049
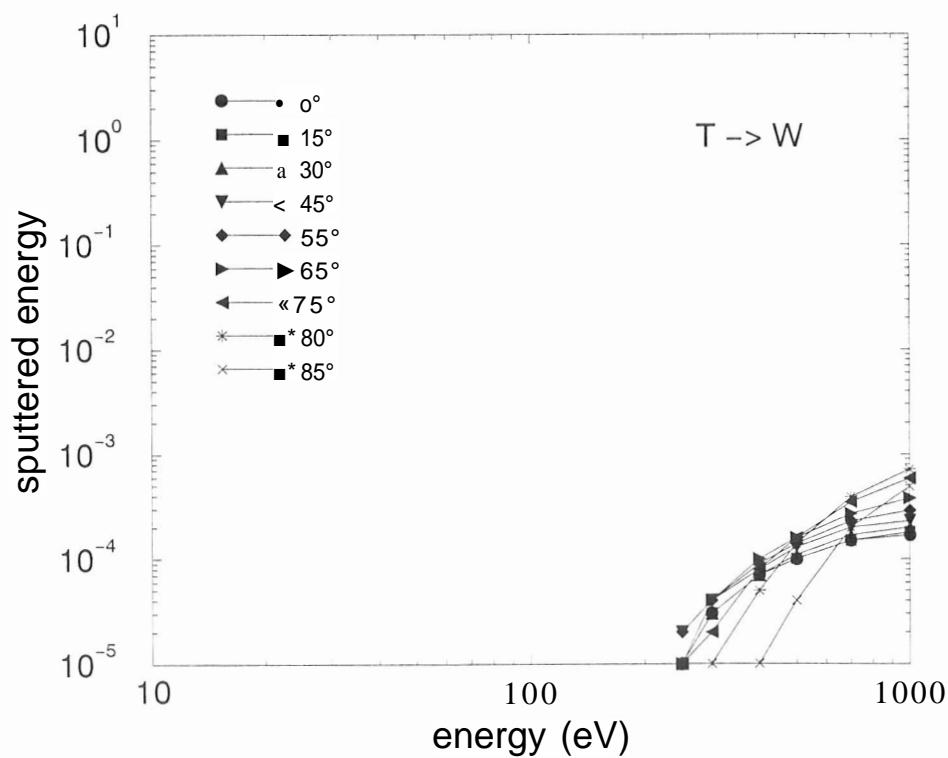
particle reflection coefficient of T by W

$z1= 1$, $m1= 3.02$, $z2=74$, $m2=183.85$, $Es=8.68$, $rho=19.29$ g/cm**3 ; ne=15, na=9

Eu(e\ )	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.75070	.75992	.78935	.83725	.87795	.91917	.95799	.97133	.97915
20	.71500	.72498	.75343	.80309	.84787	.90234	.95667	.97700	.98801
50	.66854	.67892	.70706	.75342	.79753	.85959	.93659	.97290	.99301
100	.64038	.64962	.67529	.71812	.76300	.81976	.90558	.95908	.99345
140	.62492	.63367	.65934	.70379	.74575	.80161	.88816	.94748	.99244
160	.61911	.62752	.65358	.69791	.73875	.79471	.88040	.94154	.99176
170	.61647	.62500	.65088	.69504	.73619	.79140	.87670	.93898	.99143
180	.61374	.62233	.64828	.69214	.73308	.78855	.87337	.93641	.99108
200	.60910	.61756	.64387	.68752	.72816	.78281	.86676	.93124	.99024
250	.59885	.60736	.63395	.67759	.71802	.77210	.85329	.91882	.98801
300	.58991	.59864	.62581	.66908	.70948	.76319	.84230	.90830	.98548
400	.57451	.58383	.61143	.65555	.69677	.74890	.82606	.89035	.97982
500	.56344	.57161	.59875	.64479	.68528	.73878	.81308	.87647	.97352
700	.54285	.55337	.58218	.63035	.66770	.72224	.79641	.85452	.96016
1000	.52043	.53050	.55917	.60709	.65050	.70334	.77565	.83411	.94210
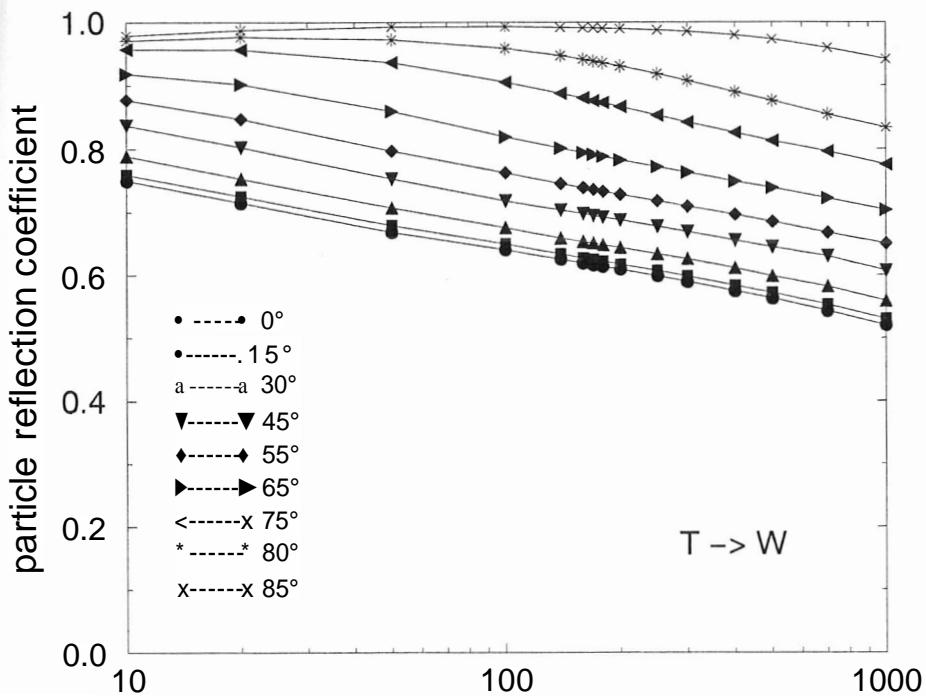
Energy reflection coefficient of T by W
z1= 1 , m1= 3.02 , z2=74 , m2=183.85 , Es=8.68   , rho=19.29 g/cm**3 ; ne=15, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.55703	.57014	.61101	.68020	.74308	.81210	.88083	.90635	.92227
20	.51248	.52521	.56428	.63543	.70392	.79169	.88696	.92624	.94975
50	.45817	.47041	.50469	.56775	.63191	.72710	.85803	.92550	.96730
100	.42461	.43484	.46693	.52065	.58211	.66699	.80949	.90334	.97131
140	.40874	.41842	.44822	.50304	.55884	.64094	.78074	.88416	.97036
160	.40263	.41205	.44185	.49590	.55034	.63113	.76836	.87368	.96941
170	.40007	.40940	.43891	.49239	.54680	.62651	.76258	.86992	.96887
180	.39719	.40661	.43606	.48909	.54308	.62229	.75732	.86563	.96829
200	.39241	.40171	.43133	.48385	.53685	.61456	.74715	.85719	.96696
250	.38231	.39148	.42086	.47228	.52408	.59948	.72651	.83721	.96315
300	.37372	.38304	.41233	.46276	.51391	.58797	.71013	.82017	.95878
400	.35932	.36887	.39764	.4471i	.49886	.56891	.68564	.79164	.94897
500	.34907	.35819	.38578	.43713	.48532	.55614	.66721	.77005	.93836
700	.33113	.34060	.36906	.42095	.46684	.53585	.64250	.73619	.91620
1000	.31124	.32083	.34767	.39773	.44760	.51501	.61633	.70654	.88652
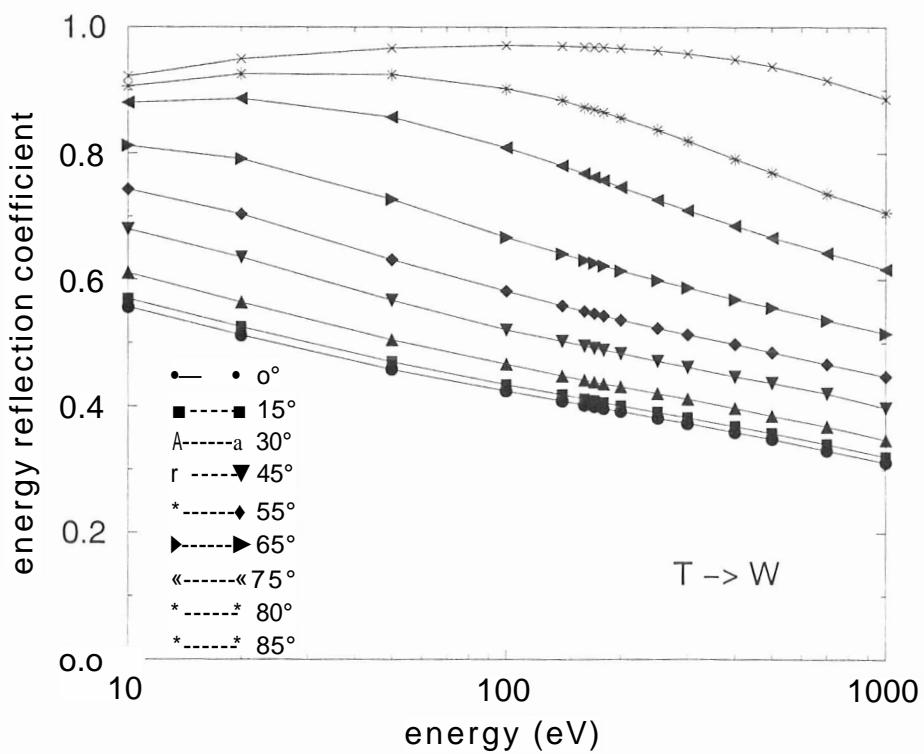
Average depth of implanted T in W

$z1= 1$, $m1= 3.02$, $z2=74$, $m2=183.85$, $Es=8.68$, $rho=19.29$ g/cm**3 ; ne=15, na-9

nFWF	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	12.9	12.8	12.8	12.8	12.6	12.6	12.5	12.4	12.4
20	18.3	18.3	18.2	18.2	17.9	17.9	17.8	17.8	17.7
50	29.5	29.5	29.3	29.1	28.9	28.6	28.6	28.4	28.2
100	42.7	42.8	42.3	42.0	41.5	41.2	40.9	40.8	40.7
140	51.3	51.2	50.8	50.3	50.0	49.6	49.2	48.7	49.3
160	55.3	55.1	54.7	54.1	53.6	53.3	52.9	52.8	52.9
170	57.1	57.0	56.6	55.9	55.5	55.0	54.6	54.5	53.7
180	59.0	58.8	58.4	57.7	57.3	56.7	56.4	56.2	56.0
200	62.6	62.4	61.9	61.3	60.7	60.2	59.8	59.7	59.5
250	71.0	70.9	70.3	69.5	68.8	68.2	67.6	67.5	67.2
300	78.9	78.6	77.9	76.9	76.2	75.5	75.0	74.8	74.4
400	93.3	93.1	92.1	91.0	89.9	89.2	88.4	88.4	88.1
500	106.7	106.4	105.1	103.7	102.6	101.6	100.7	100.8	99.6
700	131.1	130.4	128.6	127.7	125.9	124.3	123.0	122.8	124.4
1000	164.4	163.6	161.9	159.5	157.1	155.4	153.4	153.1	153.5
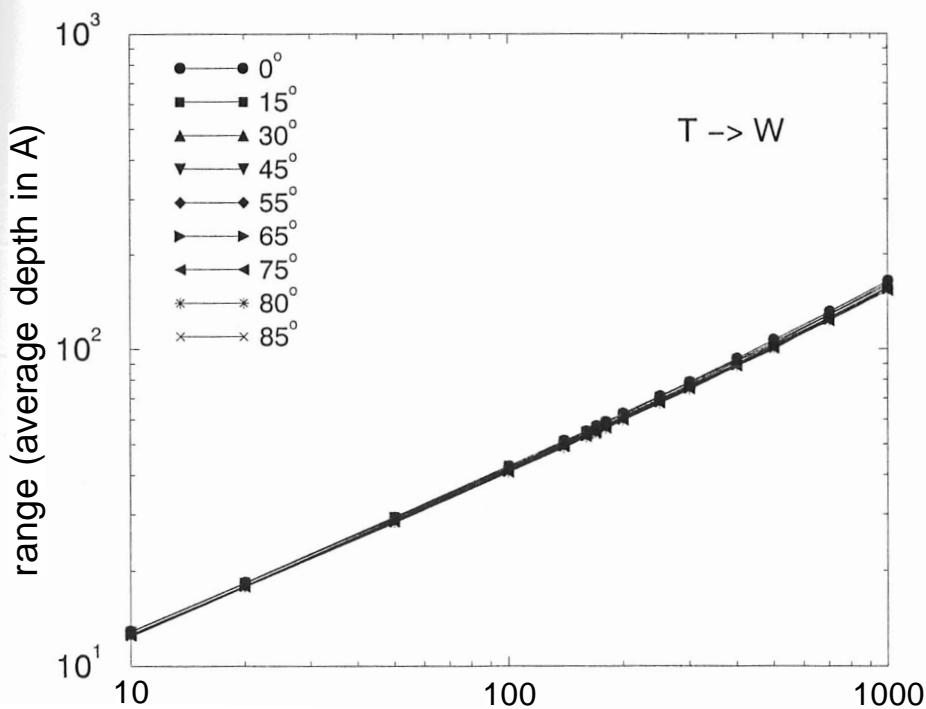
Sputter yield of W by He
z1= 2 , m1= 4.00 , z2=74 . m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=20, na=9

| Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
125	.00001	.00001	.00001	.00001	.00001	.00000	.00000	.00000	.00000
130	.00003	.00004	.00004	.00003	.00003	.00002	.00000	.00000	.00000
140	.00013	.00014	.00014	.00015	.00012	.00007	.00002	.00000	.00000
150	.00031	.00032	.00032	.00032	.00029	.00019	.00006	.00001	.00000
170	.00095	.00094	.00101	.00101	.00087	.00061	.00023	.00006	.00000
200	.00233	.00244	.00250	.00263	.00227	.00186	.00076	.00023	.00000
250	.00542	.00527	.00576	.00592	.00610	.00486	.00249	.00091	.00002
300	.00861	.00863	.00941	.01017	.00996	.00935	.00574	.00252	.00008
350	.01212	.01168	.01277	.01418	.01487	.01446	.01022	.00580	.00024
400	.01466	.01495	.01634	.01866	.01968	.02089	.01789	.00986	.00056
500	.02030	.02098	.02274	.02633	.02900	.03336	.03322	.02319	.00201
600	.02-122	.02570	.02805	.03297	.03789	.04671	.05193	.04085	.00495
700	.02879	.03038	.03310	.03883	.04581	.05817	.06777	.05845	.00914
1000	.03779	.03970	.04321	.05493	.06781	.08928	.11460	.10600	.02630
1400	.04567	.04697	.05308	.07022	.08853	.11810	.15910	.15700	.05538
2000	.05154	.05432	.06310	.08249	.10700	.14750	.20120	.21080	.10120
5000	.05912	.06356	.07643	.10310	.13860	.18930	.28430	.33100	.26720
10000	.05629	.06277	.07469	.10360	.13600	.19580	.30740	.38120	.39330
20000	.04778	.05242	.06443	.09043	.12150	.17670	.29010	.39210	.47890
50000	.03234	.03484	.04490	.06458	.08694	.12740	.22580	.32480	.49430
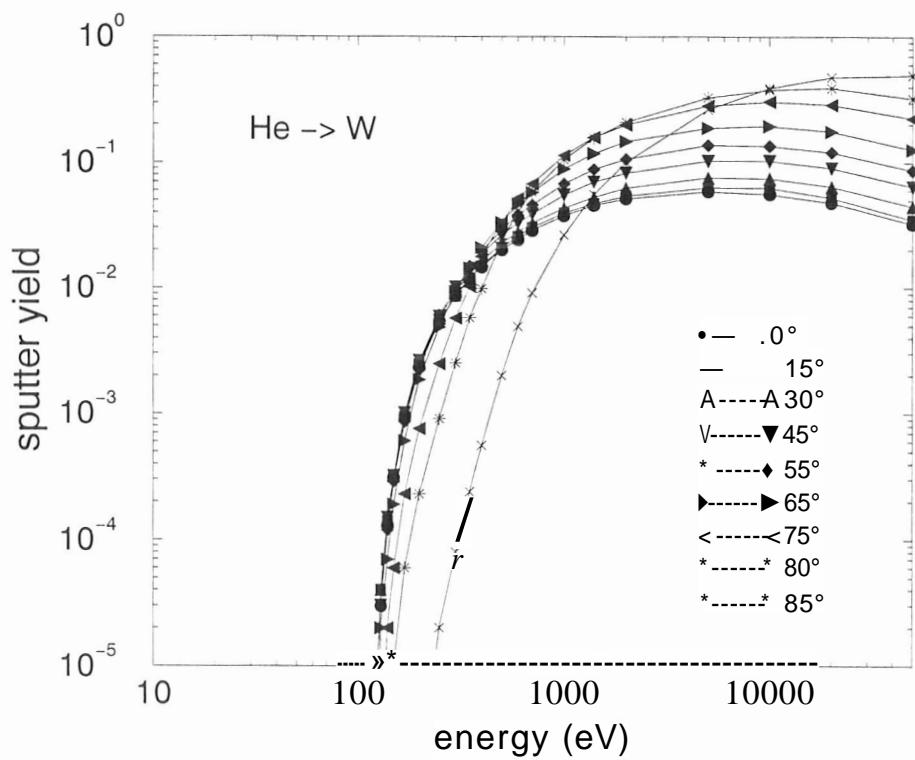
Sputtered energy of W by He

$z1= 2$, $m1= 4.00$, $z2=74$, $m2=183.85$, Es—8.68 , rho=19.29 g/cni**3 ; ne=17, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
170	.00001	.00001	.00001	.00001	.00001	.00001	.00000	.00000	.00000
200	.00003	.00003	.00003	.00004	.00003	.00003	.00001	.00000	.00000
250	.00009	.00008	.00009	.00010	.00010	.00008	.00004	.00001	.00000
300	.00015	.00015	.00016	.00018	.00018	.00017	.00010	.00004	.00000
350	.00021	.00020	.00023	.00025	.00027	.00027	.00019	.00011	.00000
400	.00025	.00026	.00028	.00033	.00036	.00038	.00033	.00019	.00001
500	.00035	.00036	.00040	.00045	.00051	.00059	.00062	.00046	.00005
600	.00040	.00042	.00047	.00055	.00063	.00078	.00094	.00081	.00011
700	.00046	.00048	.00053	.00062	.00073	.00095	.00120	.00115	.00022
1000	.00054	.00056	.00062	.00076	.00096	.00129	.00186	.00191	.00058
1400	.00056	.00058	.00065	.00086	.00109	.00152	.00227	.00250	.00110
2000	.00053	.00055	.00064	.00083	.00111	.00160	.00242	.00282	.00170
5000	.00036	.00038	.00045	.00063	.00088	.00125	.00200	.00257	.00255
10000	.00021	.00023	.00029	.00041	.00056	.00085	.00145	.00190	.00234
20000	.00010	.00012	.00016	.00023	.00031	.00049	.00086	.00123	.00173
50000	.00003	.00004	.00005	.00008	.00013	.00019	.00036	.00055	.00091
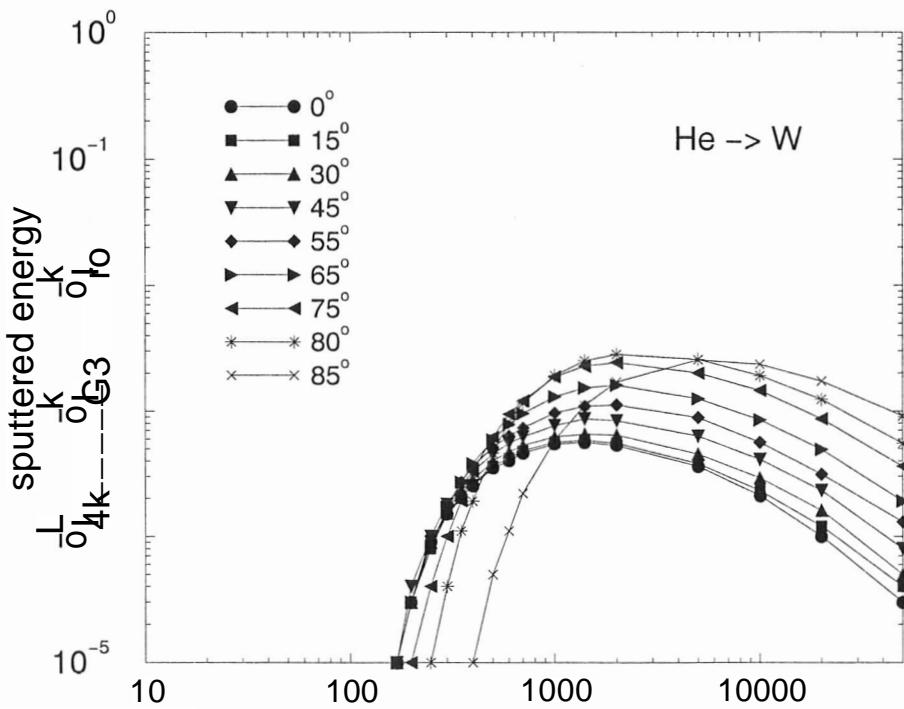
Particle reflection coefficient of He by W

zl= 2 , ml= 4.00 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 : ne=24, na=9

Eq(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.80881	.82072	.84788	.89327	.92984	.96981	.99587	.99958	1.00000
20	.74900	.75935	.79255	.84674	.89455	.94771	.99100	.99908	1.00000
50	.67978	.68785	.71907	.77456	.83059	.89929	.97396	.99620	.99999
100	.63676	.64734	.67648	.72775	.77912	.85018	.94628	.98816	.99995
125	.62369	.63369	.66301	.71403	.76417	.83428	.93419	.98359	.99991
130	.62179	.63148	.66073	.71162	.76174	.83131	.93198	.98267	.99989
140	.61779	.62744	.65660	.70710	.75670	.82582	.92752	.98045	.99989
150	.61409	.62366	.65249	.70362	.75254	.82103	.92312	.97843	.99985
170	.60731	.61771	.64650	.69579	.74502	.81205	.91494	.97440	.99974
200	.59825	.60730	.63627	.68633	.73496	.80113	.90398	.96824	.99964
250	.58826	.59664	.62587	.67571	.72243	.78663	.88891	.95829	.99930
300	.57847	.58750	.61717	.66526	.71336	.77454	.87443	.94855	.99880
350	.57060	.58181	.60978	.65752	.70293	.76527	.86410	.93945	.99816
400	.56425	.57329	.60116	.65080	.69651	.75673	.85243	.93075	.99740
500	.55148	.56342	.59028	.63784	.68507	.74483	.83737	.91521	.99541
600	.54254	.55398	.58282	.63314	.67528	.73481	.82303	.90221	.99294
700	.53500	.54298	.57458	.62512	.66684	.72538	.81377	.89020	.99010
1000	.51403	.52251	.55463	.60201	.64898	.70714	.79058	.86221	.97951
1400	.49225	.50241	.53313	.58644	.63040	.68929	.76924	.83799	.96354
2000	.46792	.47991	.50896	.56147	.61148	.67078	.75169	.81361	.94064
5000	.39423	.40627	.44224	.49827	.55010	.61761	.69958	.75729	.86648
10000	.32645	.34058	.37552	.43687	.49398	.56673	.65476	.71659	.81568
20000	.24888	.26267	.30221	.36696	.43113	.50838	.61042	.67476	.76889
50000	.14331	.15397	.19163	.25859	.32811	.41959	.53890	.61239	.71826
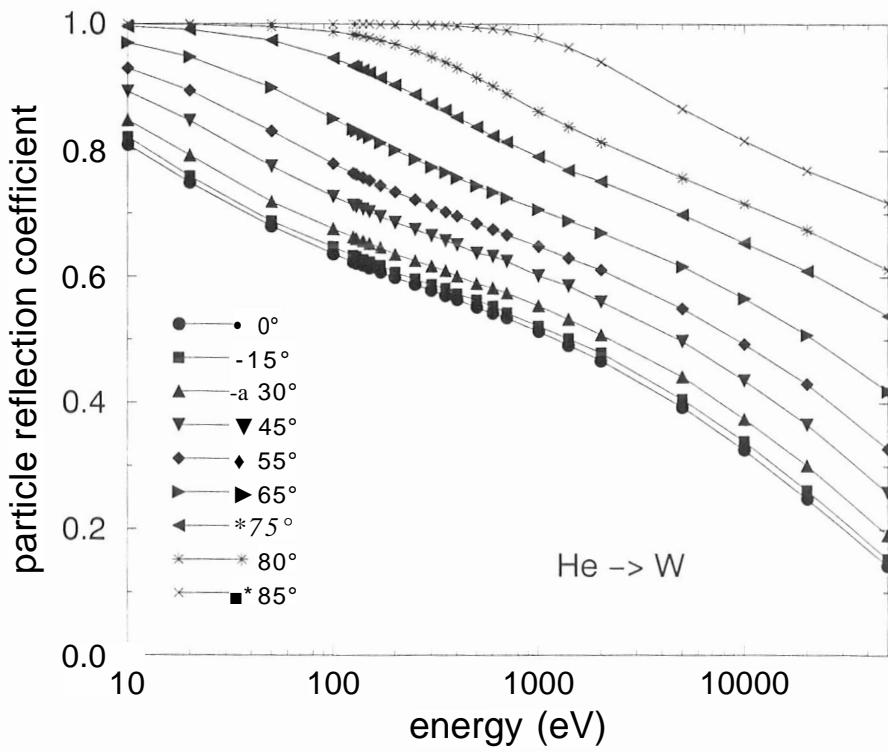
He -> W

particle reflection coefficient vs energy (eV)

Legend:
● 0°
■ -15°
▲ -a 30°
▼ 45°
♦ 55°
► 65°
◄ *75°
* 80°
× ■*85°

Energy reflection coefficient of He by W

zl= 2 , ml= 4.00 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=24, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.59539	.61379	.65767	.73500	.80329	.88632	.96205	.98389	.99452
20	.52754	.54255	.59005	.67449	.75348	.85109	.95046	.98136	.99448
50	.45165	.46334	.50307	.58076	.66346	.77642	.91651	.97159	.99341
100	.40696	.41900	.45383	.52080	.59352	.70201	.86767	.95292	.99171
125	.39439	.40529	.43932	.50356	.57254	.67849	.84715	.94356	.99092
130	.39220	.40308	.43687	.50064	.56927	.67424	.84356	.94158	.99075
140	.38825	.39901	.43240	.49531	.56269	.66624	.83612	.93753	.99047
150	.38466	.39512	.42834	.49083	.55712	.65901	.82897	.93372	.99017
170	.37817	.38909	.42129	.48195	.54734	.64611	.81563	.92610	.98952
200	.37008	.38002	.41209	.47183	.53445	.63110	.79778	.91491	.98861
250	.35964	.36861	.40012	.45835	.51809	.60959	.77322	.89708	.98697
300	.35100	.36010	.39094	.44706	.50642	.59337	.75111	.88034	.98515
350	.34324	.35447	.38318	.43884	.49540	,58060	.73451	.86483	.98318
400	.33719	.34615	.37582	.43031	.48760	.57017	.71796	.85095	.98105
500	.32687	.33735	.36522	.41840	.47411	.55418	.69408	.82541	.97624
600	.31841	.32902	.35694	.41157	.46221	.54055	.67397	.80302	.97070
700	.31195	.31965	.34993	.40393	.45324	.53034	.66046	.78496	.96507
1000	.29467	.30280	.33260	.38270	.43436	.50701	.62713	.74186	.94509
1400	.27698	.28572	.31418	.36585	.41538	.48633	.59930	.70545	.91741
2000	.25763	.26767	.29400	.34430	.39613	.46589	.57434	.66905	.87950
5000	.20203	.21064	.23893	.28769	.33714	.40819	.51125	.59129	.76317
10000	.15509	.16389	.18842	.23651	.28562	.35656	.45855	.54075	.68529
20000	.10680	.11437	.13771	.18071	.22941	.29774	.40394	.48507	.61851
50000	.05135	.05616	.07267	.10684	.14763	.21329	.31917	.40235	.53848
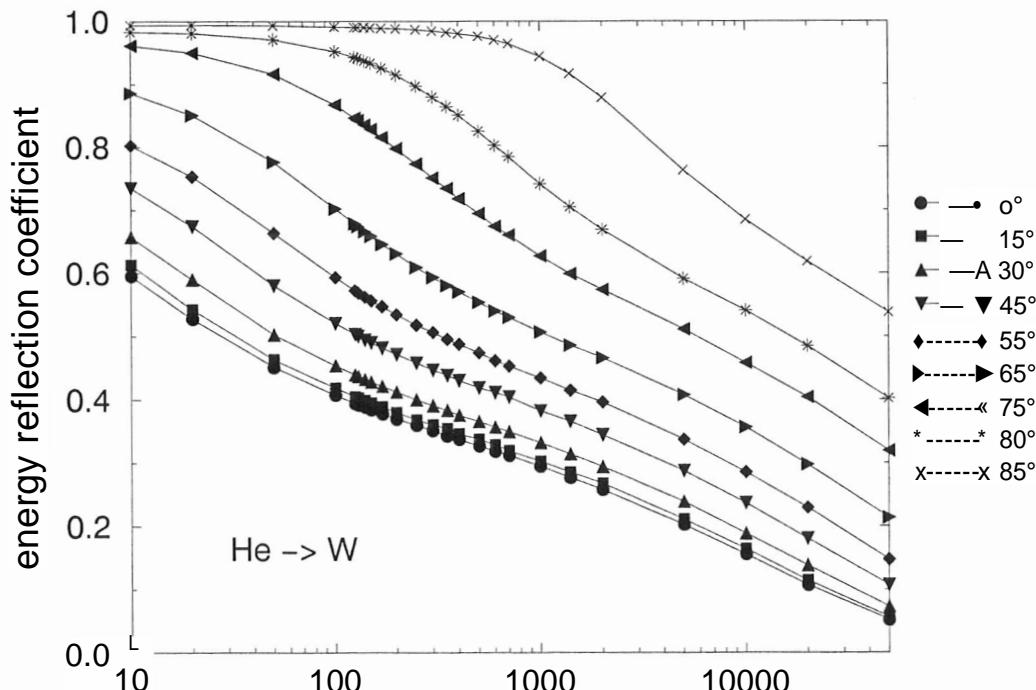
Average depth of implanted He in W

$z1= 2$, $m1= 4.00$, $z2=74$, $m2=183.85$, $Es=8.68$, $rho=19.29$ g/cm**3 ; $ne=24$, $na=9$

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	9.2	9.2	9.1	9.1	9.0	9.0	8.7	8.8	8.7
20	12.4	12.4	12.3	12.3	12.2	12.1	11.9	11.7	12.2
50	19.0	19.2	19.0	18.8	18.6	18.5	18.3	18.1	16.2
100	26.9	26.9	26.7	26.5	26.1	26.1	26.0	25.3	25.5
125	30.2	30.2	29.9	29.6	29.3	29.1	28.8	28.5	27.2
130	30.9	30.8	30.5	30.2	29.9	29.6	29.4	29.3	30.6
140	32.1	32.0	31.7	31.3	31.1	30.8	30.5	30.3	32.5
150	33.2	33.1	32.9	32.4	32.2	31.9	31.6	31.4	30.5
170	35.5	35.4	35.1	34.6	34.3	34.0	33.7	33.4	36.5
200	38.5	38.4	38.1	37.5	37.2	36.9	36.6	36.4	35.9
250	43.5	43.4	42.9	42.4	41.8	41.5	41.2	41.0	40.4
300	48.1	47.7	47.4	46.6	46.2	45.8	45.3	45.1	44.5
350	52.2	52.0	51.4	50.9	50.0	49.6	49.4	48.9	47.9
400	56.2	55.8	55.4	54.6	53.9	53.2	52.8	52.8	52.4
500	63.6	63.4	62.6	62.0	61.0	60.5	59.5	59.3	58.9
600	70.6	70.3	69.4	68.4	67.4	67.1	65.9	65.7	65.7
700	77.1	76.9	75.9	74.7	73.9	72.9	72.2	71.9	71.7
1000	95.3	94.7	93.4	91.7	90.7	89.3	88.1	87.6	88.4
1400	116.3	116.5	114.7	112.4	110.8	109.3	107.1	107.5	107.0
2000	146.1	145.6	143.0	140.0	137.4	135.2	133.9	133.2	132.7
5000	269.1	267.1	263.3	254.7	248.9	243.5	239.2	236.7	237.0
10000	443.6	440.3	428.8	412.1	401.8	389.4	380.9	378.7	374.9
20000	754.2	745.4	720.5	686.7	659.1	633.2	615.1	606.4	600.7
50000	1578.2	1550.3	1471.0	1367.3	1282.1	1209.4	1150.6	1124.4	1110.4
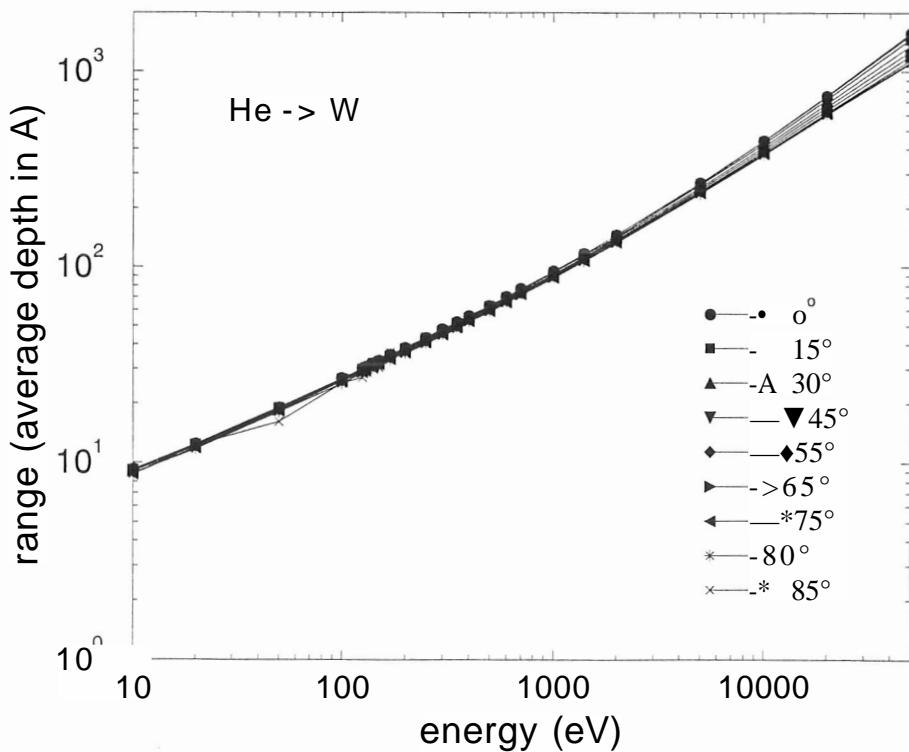
Sputter yield of W by N

z1= 7 , m1= 14.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=16, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
48	.00002	.00002	.00001	.00001	.00000	.00000	.00000	.00000	.00000
50	.00006	.00005	.00004	.00002	.00001	.00000	.00000	.00000	.00000
52	.00013	.00013	.00009	.00005	.00003	.00001	.00000	.00000	.00000
55	.00036	.00033	.00026	.00015	.00008	.00003	.00000	.00000	.00000
60	.00097	.00096	.00075	.00047	.00028	.00011	.00002	.00000	.00000
70	.00326	.00326	.00284	.00202	.00131	.00059	.00011	.00002	.00000
80	.00700	.00670	.00606	.00461	.00318	.00161	.00035	.00007	.00001
90	.01172	.01138	.01061	.00858	.00613	.00336	.00086	.00021	.00002
100	.01722	.01698	.01598	.01300	.01029	.00607	.00178	.00049	.00004
120	.02772	.02785	.02821	.02528	.02173	.01430	.00543	.00170	.00012
140	.03993	.04074	.04143	.04063	.03499	.02647	.01144	.00367	.00025
200	.07566	.08000	.08322	.08698	.09066	.07769	.04111	.01501	.00086
300	.13180	.13510	.14830	.17140	.18480	.18040	.11490	.04561	.00265
500	.21350	.22070	.25230	.31040	.35100	.36810	.26550	.12600	.00867
1000	.33870	.35760	.42180	.53510	.62390	.68900	.58020	.34850	.04005
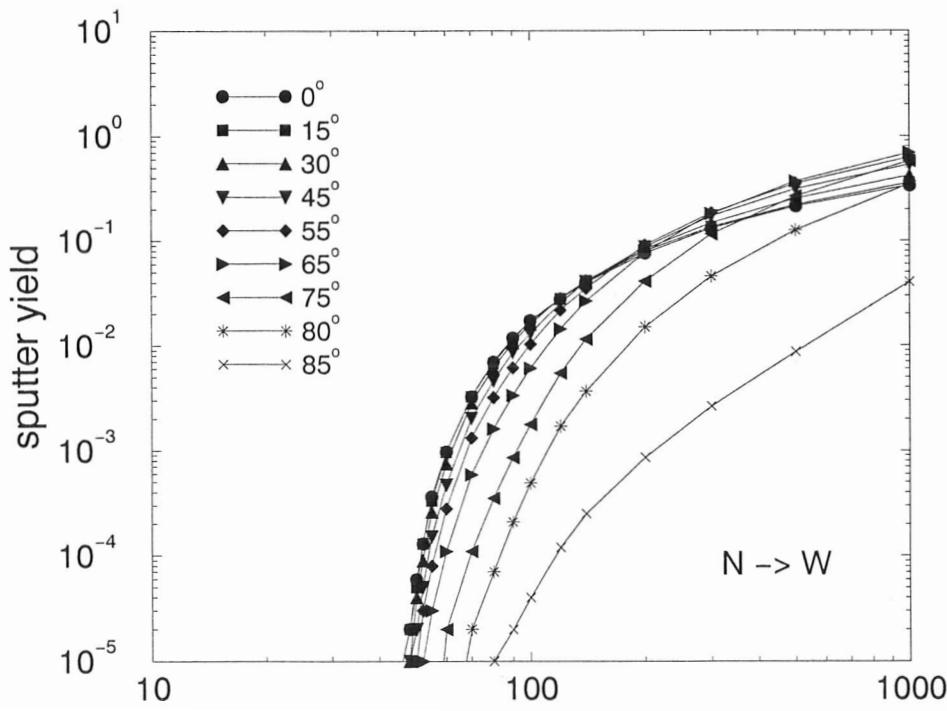
Sputtered energy of W by N
zl= 7 , ml= 14.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
55	.00001	.00001	.00001	.00000	.00000	.00000	.00000	.00000	.00000
60	.00003	.00003	.00002	.00001	.00001	.00000	.00000	.00000	.00000
70	.00012	.00012	.00010	.00007	.00005	.00002	.00000	.00000	.00000
80	.00028	.00027	.00025	.00019	.00013	.00007	.00001	.00000	.00000
90	.00052	.00051	.00049	.00039	.00029	.00016	.00004	.00001	.00000
100	.00079	.00080	.00076	.00061	.00051	.00031	.00008	.00002	.00000
120	.00135	.00135	.00140	.00130	.00113	.00075	.00029	.00010	.00001
140	.00192	.00198	.00210	.00211	.00189	.00147	.00065	.00023	.00002
200	.00356	.00378	.00401	.00441	.00474	.00430	.00261	.00104	.00006
300	.00549	.00578	.00639	.00763	.00872	.00935	.00708	.00312	.00019
500	.00736	.00771	.00878	.01153	.01379	.01633	.01423	.00770	.00057
1000	.00826	.00876	.01045	.01398	.01773	.02211	.02235	.01554	.00206
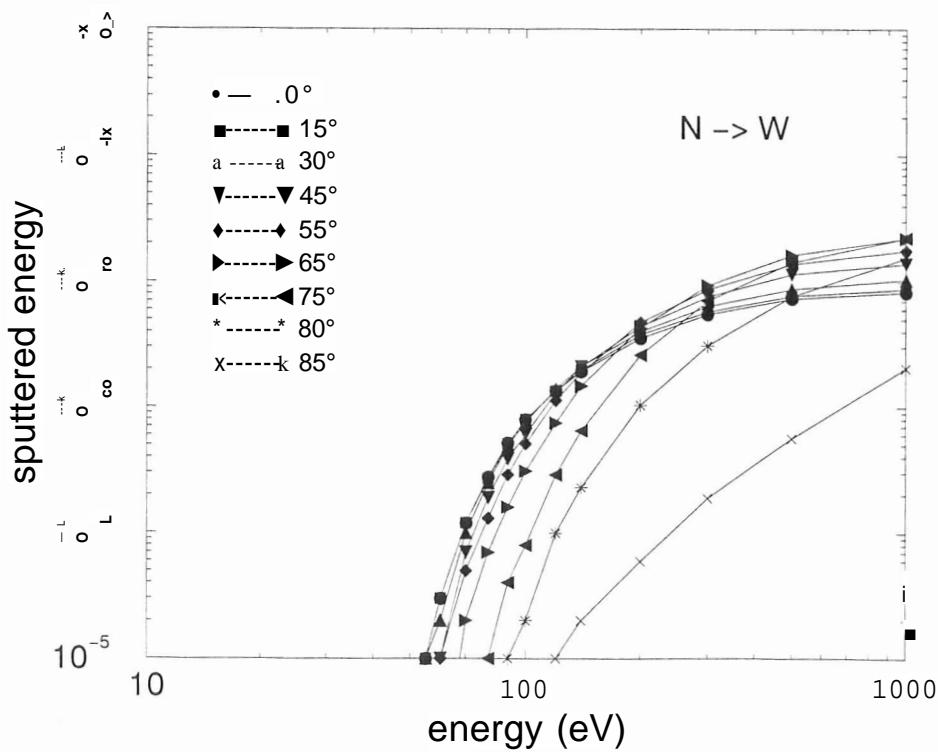
Particle reflection coefficient of N by W

z1= 7 , m1= 14.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=18,   na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.76777	.78306	.81412	.86185	.90130	.94306	.97432	.98351	.98842
20	.71737	.73366	.77345	.83577	.88475	.93884	.98024	.99121	.99603
40	.65203	.66823	.71309	.78718	.84988	.91936	.97799	.99328	.99852
48	.63493	.65075	.69541	.77189	.83753	.91178	.97608	.99313	.99883
50	.63104	.64678	.69163	.76843	.83469	.90985	.97579	.99300	.99889
52	.62752	.64319	.68799	.76503	.83192	.90779	.97489	.99297	.99900
55	.62216	.63767	.68263	.75999	.82778	.90520	.97425	.99302	.99902
60	.61450	.62993	.67456	.75246	.82149	.90069	.97295	.99284	.99909
70	.59993	.61529	.66093	.73893	.80894	.89192	.97013	.99237	.99922
80	.58989	.60382	.64859	.72705	.79837	.88441	.96729	.99181	.99928
90	.58260	.59635	.63935	.71525	.78812	.87639	.96431	.99123	.99935
100	.56829	.58823	.63072	.70751	.77849	.86989	.96149	.99059	.99939
120	.55788	.57161	.61601	.68896	.76299	.85794	.95551	.98903	.99943
140	.54524	.56055	.60397	.67769	.74789	.84479	.95008	.98757	.99943
200	.52461	.53549	.57706	.64771	.71929	.81471	.93241	.98190	.99938
300	.49912	.51070	.55172	.61851	.68514	.77689	.90890	.97289	.99915
500	.47157	.48162	.51842	.58402	.64810	.73576	.86996	.95380	.99842
1000	.43750	.45082	.48444	.54410	.60866	.68166	.81032	.91000	.99399

Energy reflection coefficient of N by W

zl= 7 . ml= 14.01 , z2=74 , m2=183.85 . Es=8.68 , rho=19.29 g/cm**3 ; ne=18, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.44039	.46001	.50381	.57789	.64835	.73227	.81284	.84297	.86192
20	.41424	.43470	.48638	.57489	.65525	.75502	.85771	.89688	.92077
40	.36647	.38458	.43815	.53481	.62680	.74282	.87112	.92236	.95227
48	.35324	.37070	.42280	.52028	.61460	.73516	.87062	.92551	.95765
50	.35016	.36759	.41946	.51689	.61161	.73294	.87024	.92595	.95872
52	.34748	.36462	.41627	.51347	.60869	.73075	.86994	.92646	.95978
55	.34326	.36005	.41163	.50859	.60436	.72774	.86913	.92758	.96113
60	.33729	.35398	.40425	.50099	.59743	.72260	.86781	.92828	.96307
70	.32582	.34213	.39212	.48693	.58353	.71242	.86453	.92915	.96621
80	.31809	.33312	.38066	.47499	.57193	.70307	.86071	.92928	.96845
90	.31131	.32542	.37163	.46277	.56053	.69311	.85679	.92897	.97023
100	.30280	.31807	.36518	.45519	.54926	.68496	.85268	.92839	.97160
120	.29241	.30683	.35074	.43667	.53189	.66919	.84424	.92646	.97359
140	.28397	.29735	.34101	.42339	.51590	.65378	.83575	.92390	.97487
200	.26764	.27781	.31732	.39517	.48094	.61486	.81030	.91455	.97675
300	.24859	.25940	.29607	.36492	.44295	.56862	.77406	.89797	.97715
500	.22936	.23776	.26882	.33272	.40238	.51667	.71792	.86594	.97512
1000	.20721	.21595	.24475	.29997	.36209	.45309	.63392	.79548	.96423

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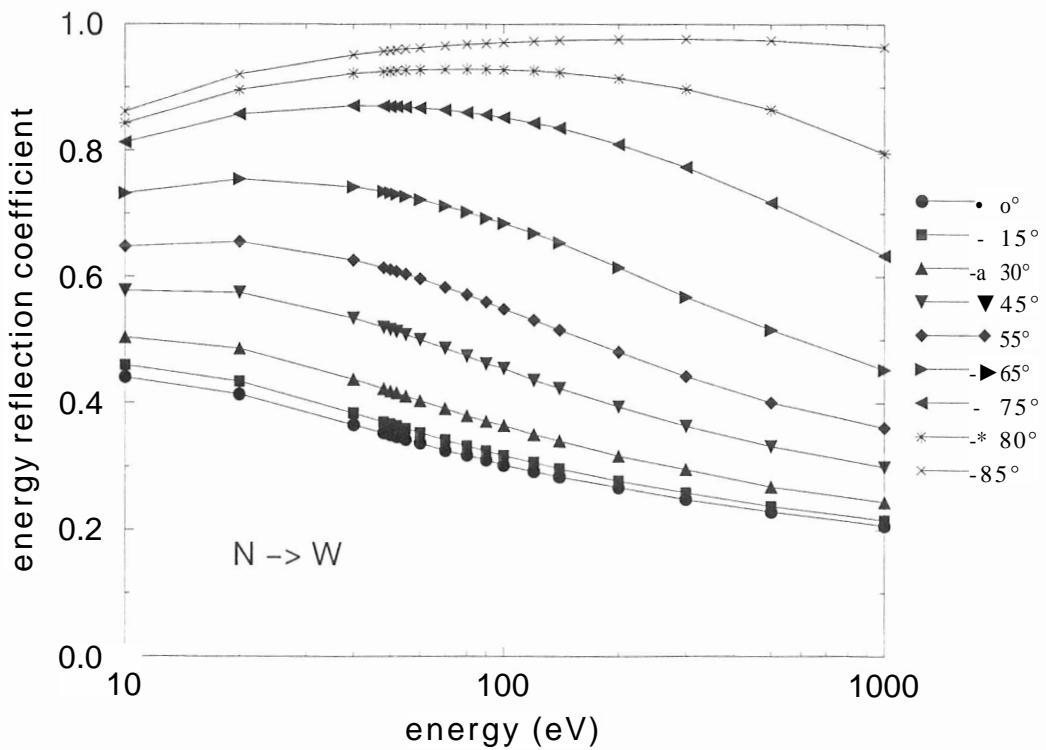
Average depth of implanted N in W

z1= 7 , m1= 14.01 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=18, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	3.8	3.8	3.8	3.7	3.7	3.6	3.5	3.5	3.4
20	5.3	5.3	5.2	5.2	5.1	5.0	4.9	4.8	4.7
40	7.2	7.2	7.2	7.1	7.0	6.8	6.6	6.5	6.5
48	7.9	7.9	7.8	7.7	7.6	7.4	7.2	7.1	7.0
50	8.0	8.0	7.9	7.8	7.7	7.6	7.4	7.2	6.9
52	8.2	8.2	8.1	8.0	7.9	7.7	7.4	7.5	7.3
55	8.4	8.4	8.3	8.2	8.1	7.9	7.7	7.6	7.3
60	8.7	8.7	8.6	8.5	8.4	8.2	8.0	7.9	7.5
70	9.4	9.4	9.3	9.1	9.0	8.9	8.6	8.4	8.3
80	10.0	10.0	9.9	9.7	9.6	9.4	9.2	9.0	8.8
90	10.6	10.6	10.4	10.2	10.1	10.0	9.7	9.4	9.4
100	11.2	11.1	11.0	10.8	10.6	10.4	10.2	10.0	9.7
120	12.2	12.2	12.0	11.8	11.6	11.4	11.1	10.9	10.8
140	13.2	13.1	13.0	12.7	12.4	12.3	11.9	11.8	11.5
200	15.7	15.7	15.5	15.1	14.8	14.5	14.1	14.0	13.7
300	19.2	19.1	19.0	18.4	18.2	17.7	17.4	17.1	16.3
500	25.0	25.0	24.7	24.1	23.4	23.2	22.6	22.4	21.6
1000	36.7	36.5	35.7	34.5	33.8	33.1	32.3	32.3	31.8
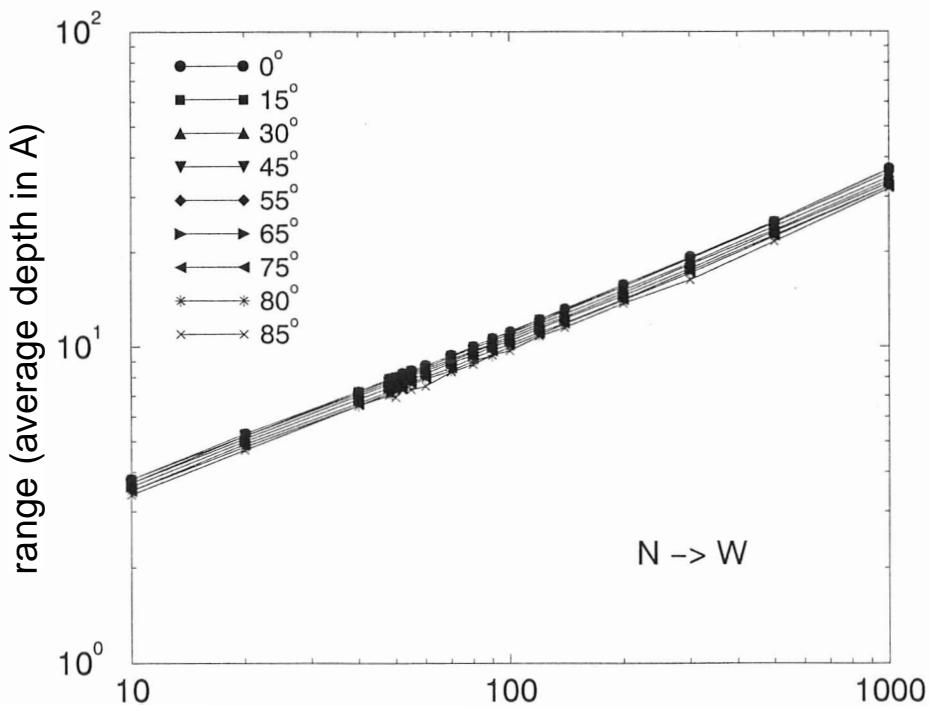
Sputter yield of W by Ne

zl=10 , ml= 20.18 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=14, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
40	.00001	.00001	.00000	.00000	.00000	.00000	.00000	.00000	.00000
45	.00016	.00014	.00010	.00005	.00002	.00000	.00000	.00000	.00000
50	.00074	.00064	.00048	.00028	.00014	.00004	.00000	.00000	.00000
60	.00361	.00330	.00274	.00178	.00109	.00044	.00005	.00001	.00000
70	.00844	.00811	.00747	.00527	.00345	.00169	.00029	.00004	.00000
80	.01581	.01481	.01410	.01051	.00752	.00417	.00095	.00018	.00000
100	.03147	.03132	.03067	.02587	.02114	.01397	.00470	.00084	.00001
140	.06965	.06937	.07150	.07050	.06579	.05084	.02057	.00465	.00004
200	.12310	.12860	.13910	.15030	.15340	.13270	.06382	.01716	.00019
300	.20200	.21370	.23790	.27700	.29080	.27540	.14610	.05072	.00089
400	.26730	.28190	.32190	.38780	.43030	.41080	.23930	.09316	.00223
500	.32410	.34470	.39960	.48750	.54070	.53550	.33660	.13870	.00454
700	.42480	.44360	.51360	.63830	.71650	.73680	.50600	.23830	.01234
1000	.53270	.56150	.66560	.81840	.94260	.97600	.75350	.39860	.02977

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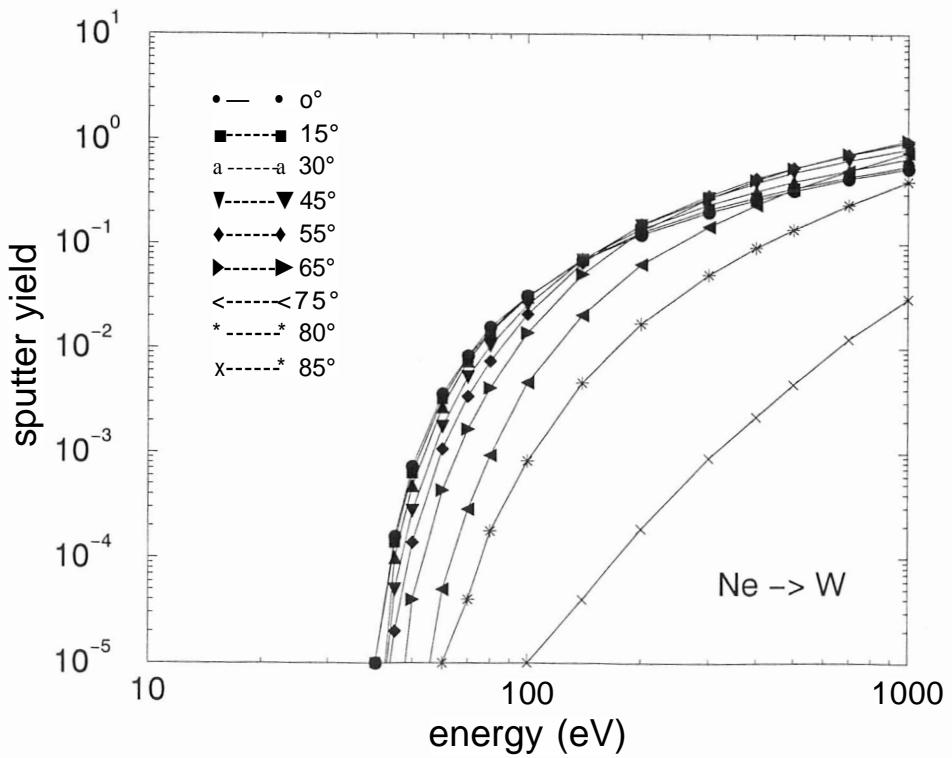
Sputtered energy of W by Ne

z1=10 , m1= 20.18 , z2=74 , m2=183.85   , Es=8.68 , rho=19.29 g/cm**3 ; ne=13, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
50	.00003	.00002	.00002	.00001	.00001	.00000	.00000	.00000	.00000
60	.00016	.00015	.00013	.00008	.00005	.00002	.00000	.00000	.00000
70	.00044	.00043	.00041	.00029	.00020	.00010	.00002	.00000	.00000
80	.00089	.00088	.00084	.00064	.00047	.00027	.00006	.00001	.00000
100	.00191	.00192	.00195	.00170	.00148	.00098	.00036	.00007	.00000
140	.00412	.00420	.00444	.00468	.00458	.00383	.00177	.00044	.00000
200	.00681	.00739	.00815	.00936	.01019	.00988	.00563	.00164	.00002
300	.00982	.01045	.01178	.01512	.01718	.01840	.01205	.00453	.00007
400	.01146	.01201	.01406	.01866	.02218	.02495	.01745	.00762	.00018
500	.01262	.01345	.01568	.02083	.02570	.02963	.02293	.01060	.00032
700	.01378	.01433	.01723	.02333	.02852	.03421	.02925	.01576	.00078
1000	.01420	.01523	.01793	.02430	.03153	.03704	.03559	.02178	.00161
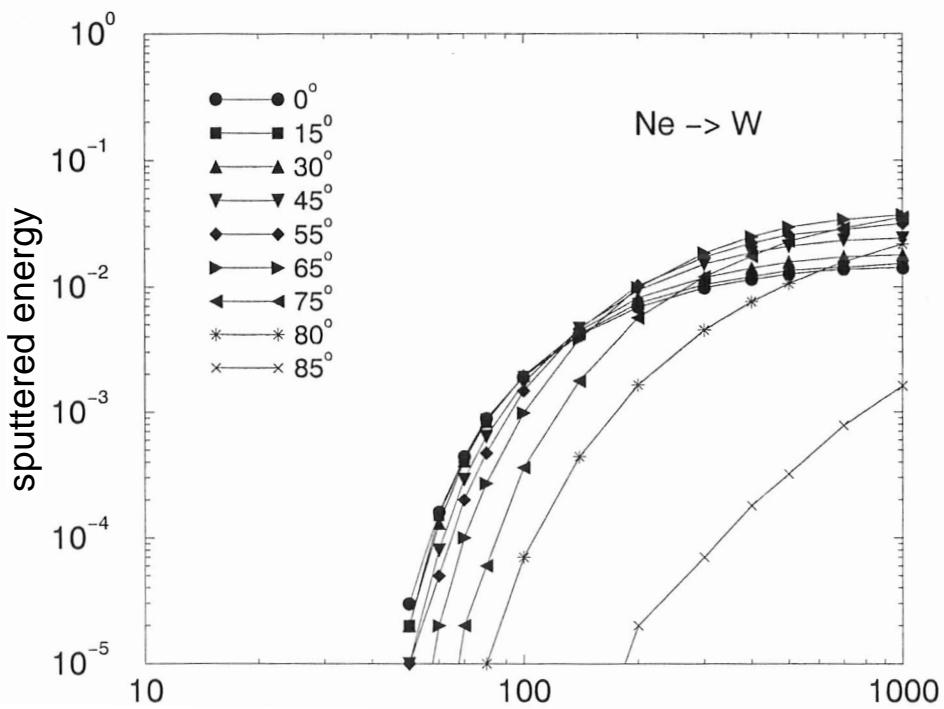
Particle reflection coefficient of Ne by W
z1=10 . m1= 20.18 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=17. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.81032	.82391	.85262	.89725	.93553	.97393	.99643	.99957	1.00000
20	.74413	.76052	.79797	.85893	.90892	.96174	.99490	.99947	1.00000
30	.69713	.71381	.75771	.82781	.88623	.94955	.99253	.99928	1.00000
40	.66220	.67996	.72643	.80348	.86739	.93775	.99044	.99903	1.00000
45	.64842	.66593	.71337	.79249	.85850	.93235	.98918	.99887	1.00000
50	.63641	.65417	.70103	.78232	.85024	.92703	.98770	.99866	1.00000
60	.61557	.63242	.68010	.76349	.83621	.91733	.98504	.99836	1.00000
70	.59888	.61537	.66182	.74756	.82286	.90792	.98228	.99799	1.00000
80	.58468	.60198	.64612	.73394	.81043	.89934	.97945	.99755	1.00000
100	.56113	.57862	.62462	.71338	.78814	.88301	.97447	.99658	.99999
140	.53071	.54350	.59293	.67607	.75364	.85779	.96296	.99428	.99999
200	.50189	.51900	.56476	.64248	.71660	.82322	.94619	.99016	.99997
300	.47054	.48682	.52692	.60690	.68210	.78583	.92503	.98211	.99991
400	.45421	.46570	.51485	.58650	.65770	.75722	.90450	.97304	.99976
500	.43922	.45628	.49603	.56010	.63590	.73820	.87990	.96565	.99964
700	.42236	.43505	.47180	.53985	.60485	.70455	.85410	.94836	.99917
1000	.40382	.41470	.45225	.51635	.58285	.67523	.81608	.92309	.99778
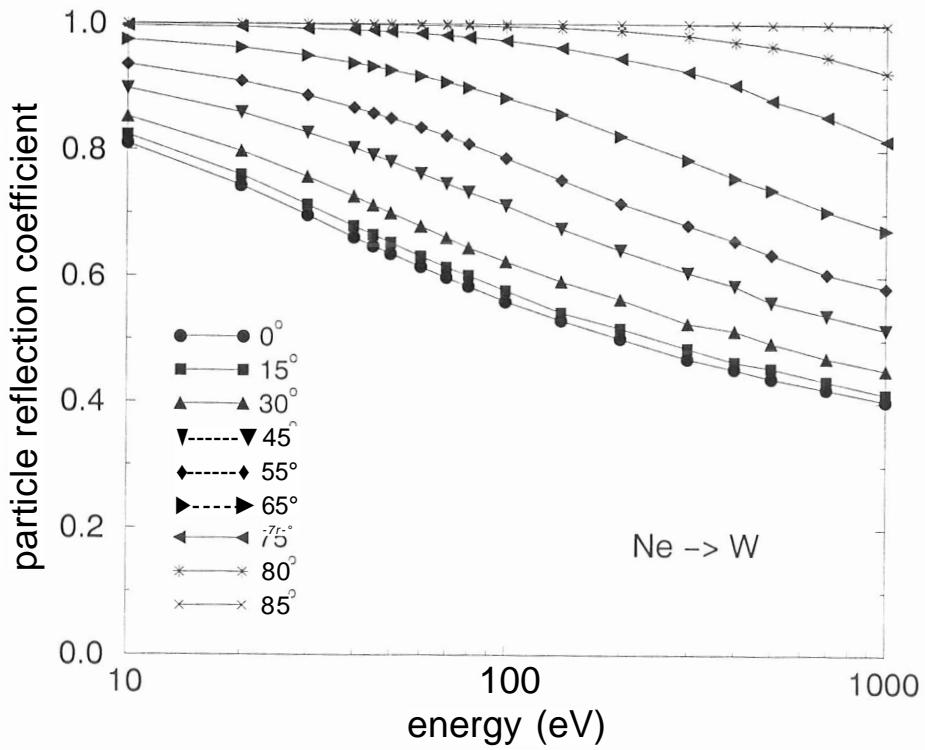
Energy reflection coefficient   of Ne by W

zl=10 , ml= 20.18 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=17, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.41045	.43246	.47956	.56805	.65910	.77622	.89722	.94440	.97712
20	.37658	.39808	.45226	.54814	.64128	.76431	.89745	.94924	.98293
30	.34838	.36916	.42555	.52615	.62267	.75110	.89311	.94978	.98492
40	.32709	.34705	.40316	.50668	.60634	.73728	.88825	.94916	.98584
45	.31851	.33767	.39350	.49746	.59792	.73096	.88607	.94862	.98610
50	.31092	.32977	.38455	.48873	.59028	.72473	.88297	.94782	.98631
60	.29775	.31558	.36912	.47270	.57667	.71336	.87764	.94656	.98652
70	.28736	.30422	.35517	.45887	.56292	.70250	.87252	.94504	.98670
80	.27892	.29546	.34274	.44607	.55051	.69245	.86737	.94339	.98670
100	.26326	.27945	.32735	.42590	.52816	.67377	.85729	.93995	.98666
140	.24505	.25693	.30211	.39397	.49339	.64141	.83899	.93293	.98623
200	.22664	.23917	.28139	.36240	.45401	.60231	.81270	.92248	.98533
300	.20812	.22075	.25595	.33295	.41889	.55539	.78030	.90515	.98366
400	.19658	.20797	.24502	.31199	.39192	.52463	.74760	.88702	.98185
500	.18899	.19918	.23210	.29569	.37474	.49800	.71839	.87394	.98024
700	.17877	.18823	.21849	.27826	.34452	.46475	.67970	.84401	.97671
1000	.16741	.17620	.20563	.26261	.32608	.43047	.62810	.80550	.97093
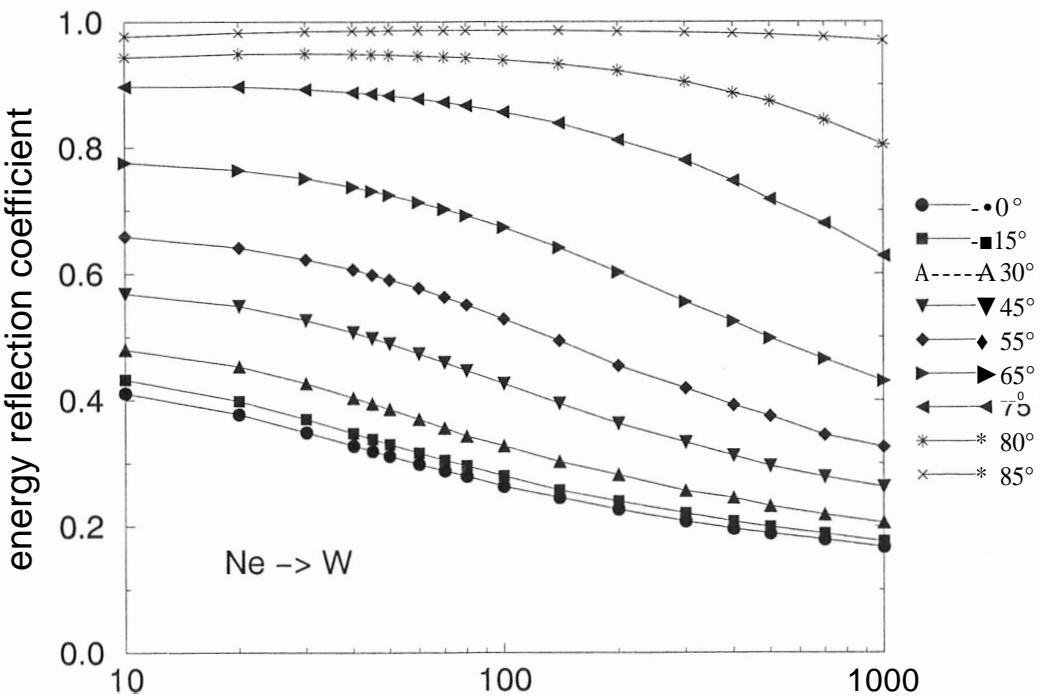
Average depth of implanted Ne in W

z1=10 , m1= 20.18 , z2=74 , m2=183.85 , Es=8.68   , rho=19.29 g/cm**3 ; ne=17, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	3.7	3.6	3.6	3.6	3.5	3.4	3.3	3.2	2.9
20	4.i	4.7	4.6	4.6	4.5	4.4	4.2	4.1	4.0
30	5.5	5.4	5.4	5.3	5.2	5.1	4.9	4,8	4.5
40	6.1	6.1	6.1	6.0	5.9	5.7	5.5	5.3	5.1
45	6.4	6.4	6.4	6.3	6.2	6.0	5.8	5.4	5.0
50	6.7	6.7	6.6	6.5	6.4	6,3	6.0	6.0	5.7
60	7.3	7.2	7.2	7.0	6.9	6.8	6,5	6.3	6.2
70	7.8	'I.1	7.6	7.5	7.4	7.2	6.9	6.7	5.6
80	8.2	8.2	8.1	8.0	7,8	7.6	7.3	7.1	6.7
100	9.1	9.0	8.9	8.8	8.6	8.4	8.1	7.9	7.7
140	10.6	10.5	10.4	10.2	10.0	9.8	9.3	9.1	8.3
200	12.6	12.5	12.3	11.9	11.6	11.5	11.2	10.8	10.8
300	15.3	15.L	14.9	14.4	14.0	13.8	13.6	13,1	12.2
400	17.6	17.4	17.1	16.8	16.2	15.9	15.4	15.2	14.4
500	19.7	19.6	19.2	18.7	18.2	17.7	17.2	17.0	16.3
700	23.5	23.4	23.0	22.2	21.6	21.0	20.7	19.9	19.0
1000	28.5	28.2	27.4	26.5	25.8	25.3	24.7	24.3	23.0
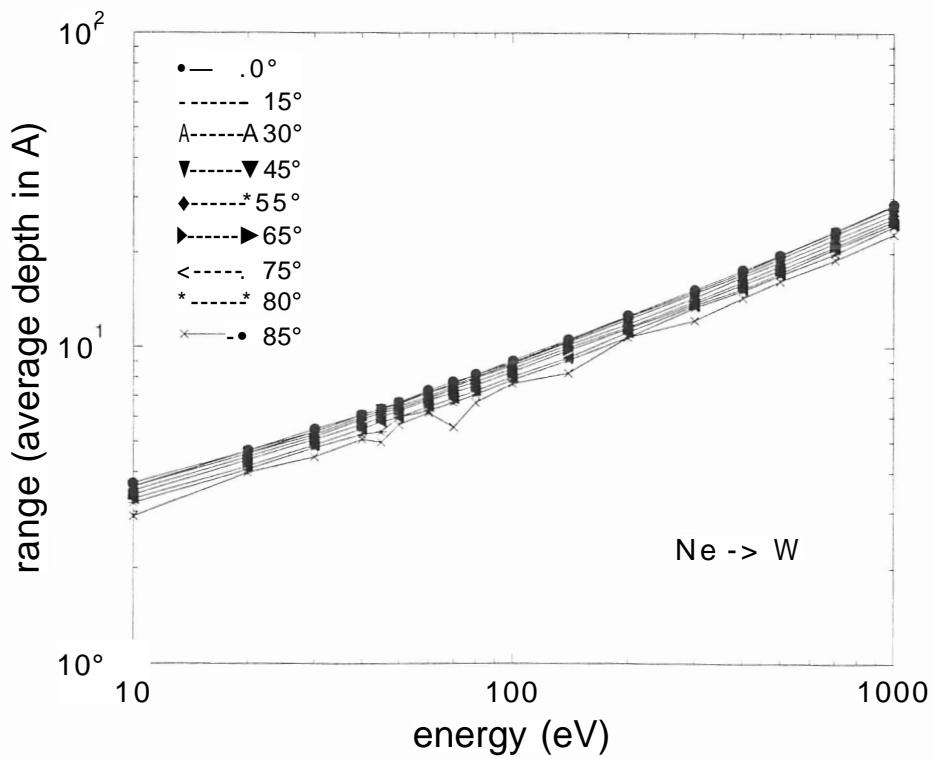
Sputtering yield of W by Ar

zl=18 , m1= 39.95 , z2=74 , m2=183.85   , Es=8.68 , rho=19.29 g/cm**3 ; ne=16, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
30	.00001	.00002	.00002	.00001	.00001	.00000	.00000	.00000	.00000
35	.00012	.00012	.00011	.00007	.00004	.00002	.00000	.00000	.00000
40	.00046	.00043	.00036	.00026	.00017	.00010	.00004	.00001	.00000
45	.00126	.00121	.00101	.00074	.00057	.00038	.00015	.00003	.00000
50	.00285	.00274	.00241	.00183	.00148	.00104	.00042	.00009	.00000
55	.00523	.00512	.00444	.00373	.00316	.00239	.00091	.00019	.00000
60	.00840	.00823	.00765	.00636	.00586	.00435	.00172	.00034	.00000
70	.01753	.01751	.01633	.01513	.01406	.01120	.00405	.00078	.00001
80	.02858	.02900	.02932	.02817	.02567	.02100	.00761	.00151	.00001
too	.05601	.05536	.05931	.06203	.05849	.04780	.01823	.00400	.00005
140	.11570	.11930	.13290	.14990	.14930	.12170	.05027	.01215	.00017
200	.20090	.21330	.25000	.29100	.29810	.25030	.11120	.03107	.00057
300	.33640	.35930	.42290	.50840	.52320	.45600	.22710	.07696	.00200
500	.56160	.59120	.70250	.84030	.89870	.81670	.46340	.18240	.00808
700	.72480	.77780	.92630	1.11100	1.19400	1.13300	.68140	.30370	.01837
1000	.92600	.99290	1.18900	1.42200	1.53600	1.51600	1.01800	.49790	.03942
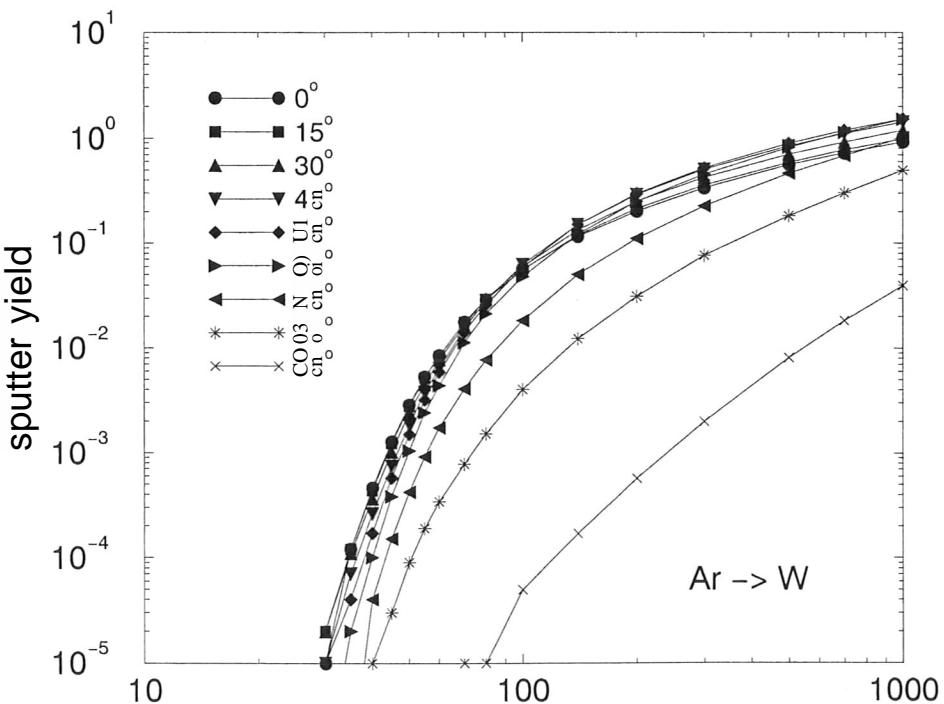
Sputtered energy of W by Ar

z1=18 . m1= 39.95 . z2=74 , m2=183.85   , Es=8.68   , rho=19.29 g/cm**3 ; ne=16. na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
35	.00001	.00001	.00001	.00001	.00000	.00000	.00000	.00000	.00000
40	.00003	.00003	.00003	.00002	.00002	.00001	.00000	.00000	.00000
45	.00008	.00008	.00008	.00006	.00005	.00004	.00002	.00000	.00000
50	.00019	.00020	.00019	.00016	.00015	.00011	.00005	.00001	.00000
55	.00037	.00038	.00036	.00035	.00032	.00026	.00011	.00002	.00000
60	.00061	.0006 1	.00065	.00062	.00062	.00049	.00022	.00005	.00000
70	.00133	.00140	.00146	.00151	.00150	.00134	.00056	.00011	.00000
80	.00227	.00239	.00264	.00286	.00284	.00264	.00110	.00022	.00000
100	.00445	.00454	.00529	.00630	.00656	.00612	.00275	.00061	.00001
140	.00870	.0092 1	.01106	.01435	.01608	.01531	.00750	.00188	.00002
200	.01352	.01474	.01835	.02468	.02909	.02909	.01566	.00453	.00006
300	.01880	.02070	.02591	.03651	.04368	.04599	.02786	.00991	.00017
500	.02404	.02590	.03282	.04675	.05820	.06295	.04445	.01919	.00061
700	.02554	.02832	.03661	.05177	.06437	.07349	.05521	.02729	.00121
1000	.02638	.02958	.03802	.05500	.06839	.07987	.06698	.03737	.00232

Particle reflection coefficient of Ar by W

zl=18 , ml= 39.95 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=18, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.74050	.75952	.79563	.85559	.90920	.96215	.99432	.99924	.99999
20	.68620	.70741	.75380	.82740	.88908	.95330	.99349	.99932	1.00000
30	.64090	.66278	.71495	.79899	.86840	.94224	.99190	.99919	1.00000
35	.62201	.64376	.69859	.78635	.85876	.93678	.99082	.99909	1.00000
40	.60527	.62715	.68315	.77446	.84975	.93140	.98970	.99898	1.00000
45	.59042	.61247	.66991	.76376	.84149	.92625	.98864	.99883	1.00000
50	.57738	.59874	.65808	.75347	.83278	.92137	.98746	.99872	1.00000
55	.56542	.58652	.64511	.74432	.82591	.91620	.98646	.99857	1.00000
60	.55602	.57759	.63543	.73370	.81820	.91240	.98511	.99847	1.00000
70	.53546	.55594	.61687	.71923	.80464	.90278	.98248	.99813	1.00000
80	.52143	.54197	.60174	.70409	.79178	.89426	.98018	.99784	1.00000
100	.49693	.51551	.57287	.67628	.77018	.87837	.97441	.99705	.99999
140	.45999	.47972	.53471	.64047	.73524	.85181	.96494	.99515	.99999
200	.43138	.44355	.49716	.59918	.69474	.81892	.95071	.99196	.99998
300	.39330	.41260	.46312	.55653	.64902	.77644	.92723	.98467	.99995
500	.35956	.37090	.41714	.50762	.59672	.72402	.88990	.97097	.99978
700	.33828	.35153	.39810	.47727	.56300	.67885	.86292	.95612	.99947
1000	.31658	.32905	.38075	.45780	.53637	.64543	.82274	.93623	.99852

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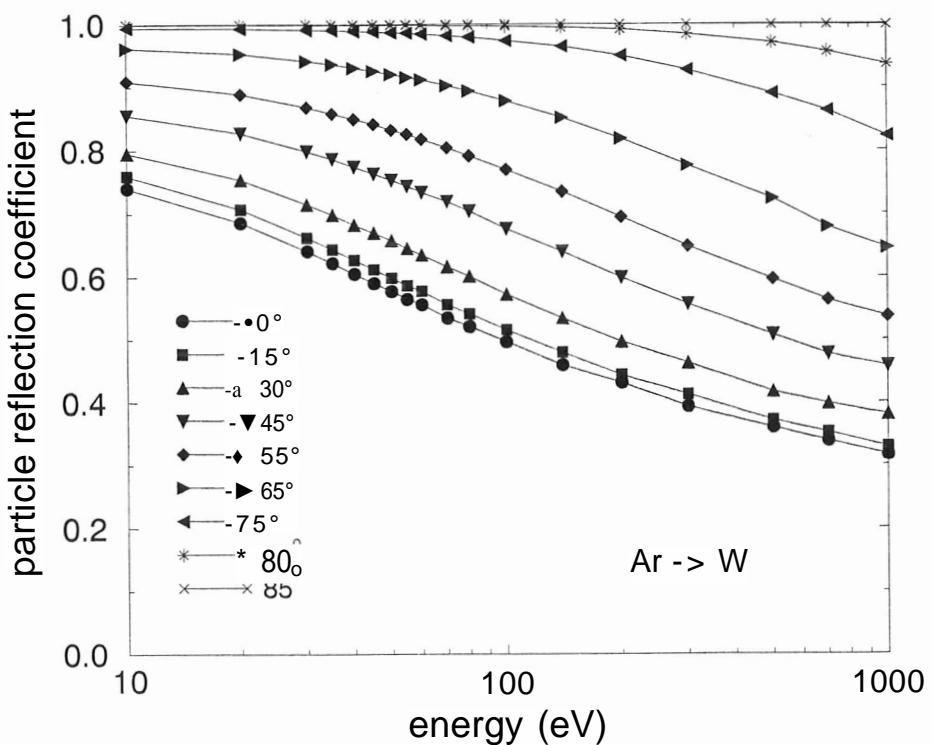
Energy reflection coefficient of Ar by W

z1=18 , m1= 39.95 , z2=74 , m2=183.85 , Es=8.68 . rho=19.29 g/cm**3 ; ne=18, na=9

E_0 (eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.23439	.25749	.30751	.40662	.51478	.66170	.82736	.90038	.95601
20	.22711	.24971	.30488	.40618	.51134	.65852	.83362	.91124	.96795
30	.21514	.23614	.29250	.39698	.50245	.65013	.83229	.91418	.97231
35	.20933	.22966	.28611	.39154	.49745	.64572	.83048	.91440	.97356
40	.20399	.22358	.27953	.38611	.49250	.64120	.82858	.91473	.97462
45	.19880	.21802	.27404	.38031	.48767	.63664	.82677	.91460	.97533
50	.19428	.21291	.26838	.37475	.48281	.63246	.82455	.91428	.97591
55	.18995	.20818	.26236	.36984	.47830	.62792	.82265	.91395	.97638
60	.18601	.20499	.25829	.36359	.47372	.62469	.82053	.91346	.97676
70	.17871	.19605	.24903	.35397	.46292	.61656	.81643	.91224	.97728
80	.17364	.18966	.24111	.34526	.45422	.60712	.81195	.91094	.97767
100	.16431	.17913	.22817	.32738	.43861	.59395	.80256	.90786	.97805
140	.14945	.16374	.20709	.30303	.41061	.56833	.78718	.90167	.97812
200	.13800	.14777	.18776	.27561	.37600	.53525	.76669	.89226	.97761
300	.12281	.13491	.16965	.24603	.33940	.49279	.73461	.87612	.97620
500	.10896	.11822	.14714	.21501	.29763	.44096	.68537	.84974	.97278
700	.10124	.11041	.13844	.19694	.27263	.40000	.64997	.82457	.96953
1000	.09390	.10036	.12902	.18225	.25162	.36712	.60070	.79167	.96423

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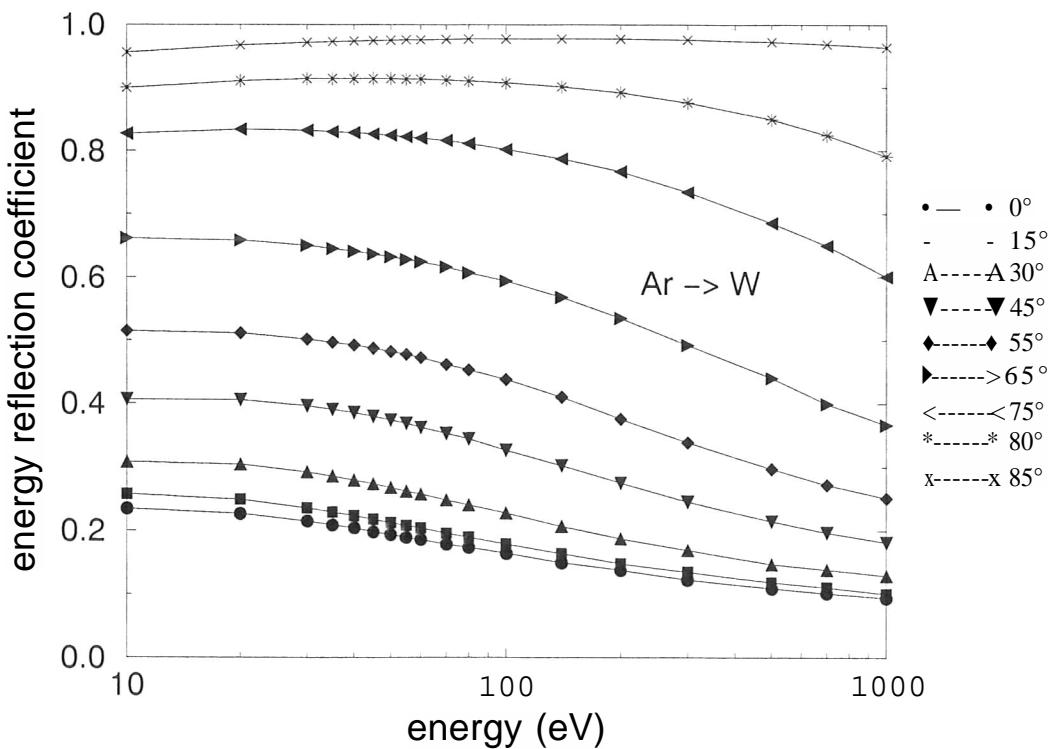
Average depth of implanted Ar in W

z1=18 , m1= 39.95 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=18, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	2.4	2.4	2.3	2.3	2.2	2.1	1.9	1.7	1.4
20	3.3	3.2	3.2	3.1	3.0	2.9	2.6	2.5	1.9
30	3.9	3.8	3.8	3.7	3.6	3.4	3.2	3.1	2.7
35	4.1	4.1	4.0	3.9	3.8	3.7	3.4	3.2	2.9
40	4.3	4.3	4.3	4.2	4.0	3.9	3.6	3.4	3.1
45	4.6	4.5	4.5	4.4	4.2	4.1	3.8	3.6	3.2
50	4.8	4.7	4.7	4.5	4.4	4.2	4.0	3.7	3.1
55	4.9	4.9	4.8	4.7	4.6	4.4	4.1	3.9	3.6
60	5.1	5.1	5.0	4.9	4.8	4.6	4.2	4.0	3.2
70	5.5	5.4	5.4	5.2	5.1	4.9	4.6	4.3	3.4
80	5.8	5.8	5.7	5.5	5.4	5.2	4.8	4.5	4.1
100	6.4	6.3	6.3	6.1	5.9	5.7	5.3	4.9	4.4
140	7.4	7.4	7.2	7.0	6.8	6.5	6.2	5.8	6.1
200	8.7	8.6	8.4	8.2	7.9	7.6	7.2	6.8	6.0
300	10.5	10.5	10.2	9.8	9.5	9.1	8.6	8.2	9.2
500	13.4	13.3	12.9	12.4	11.9	11.5	10.9	10.6	9.7
700	15.9	15.7	15.2	14.6	14.2	13.5	12.9	12.4	11.4
1000	18.9	18.8	18.1	17.4	16.6	15.9	15.3	14.8	13.8
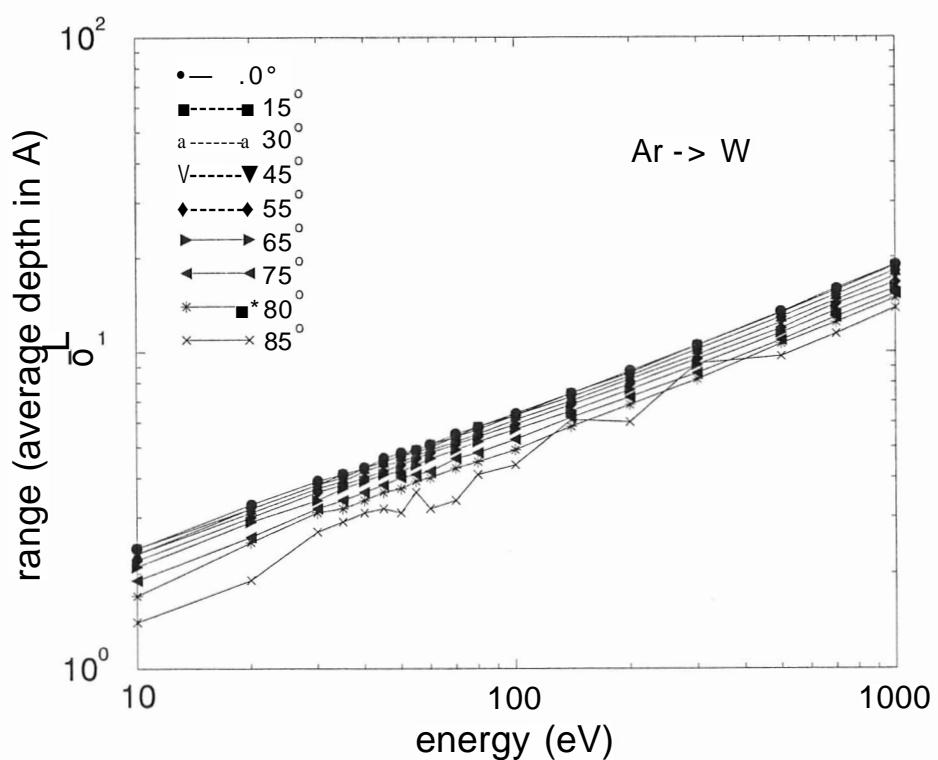
Sputter yield of W by W

z1=74 , m1=183.85 , z2=74 , m2=183.85 , Es=8.68   , rho=19.29 g/cm**3 ; ne=19, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	.00000	.00000	.00000	.00000	.00000	.00001	.00001	.00001	.00001
12	.00000	.00000	.00000	.00000	.00002	.00003	.00004	.00004	.00004
15	.00000	.00000	.00000	.00003	.00007	.00010	.00011	.00011	.00011
20	.00000	.00000	.00003	.00017	.00026	.00032	.00035	.00036	.00035
25	.00000	.00001	.00014	.00042	.00063	.00087	.00119	.00131	.00139
30	.00001	.00005	.00031	.00089	.00155	.00263	.00378	.00406	.00421
35	.00002	.00011	.00062	.00193	.00371	.00634	.00831	.00901	.00926
40	.00006	.00024	.00115	.00402	.00770	.01246	.01539	.01542	.01646
50	.00019	.00070	.00364	.01230	.02158	.03078	.03404	.03345	.03229
60	.00059	.00185	.00848	.02638	.04290	.05592	.05463	.05364	.05041
70	.00151	.00416	.01705	.04711	.07076	.08550	.08156	.07489	.06947
80	.00315	.00797	.02831	.07250	.10170	.11820	.10880	.09683	.08850
100	.00954	.02041	.06027	.13090	.17140	.18650	.16110	.13820	.11940
120	.02037	.03921	.10010	.19570	.24510	.25430	.20900	.17360	.14470
140	.03578	.06196	.14330	.26440	.32020	.32660	.25260	.20160	.16360
200	.09684	.14370	.28020	.45610	.52890	.51950	.37290	.27720	.19990
300	.22810	.29930	.50050	.73810	.84190	.79410	.55160	.38520	.23900
500	.49720	.60360	.88540	1.22200	1.36400	1.28200	.88060	.57180	.29890
1000	1.06500	1.21000	1.62300	2.13700	2.38000	2.29000	1.62200	1.02900	.42970
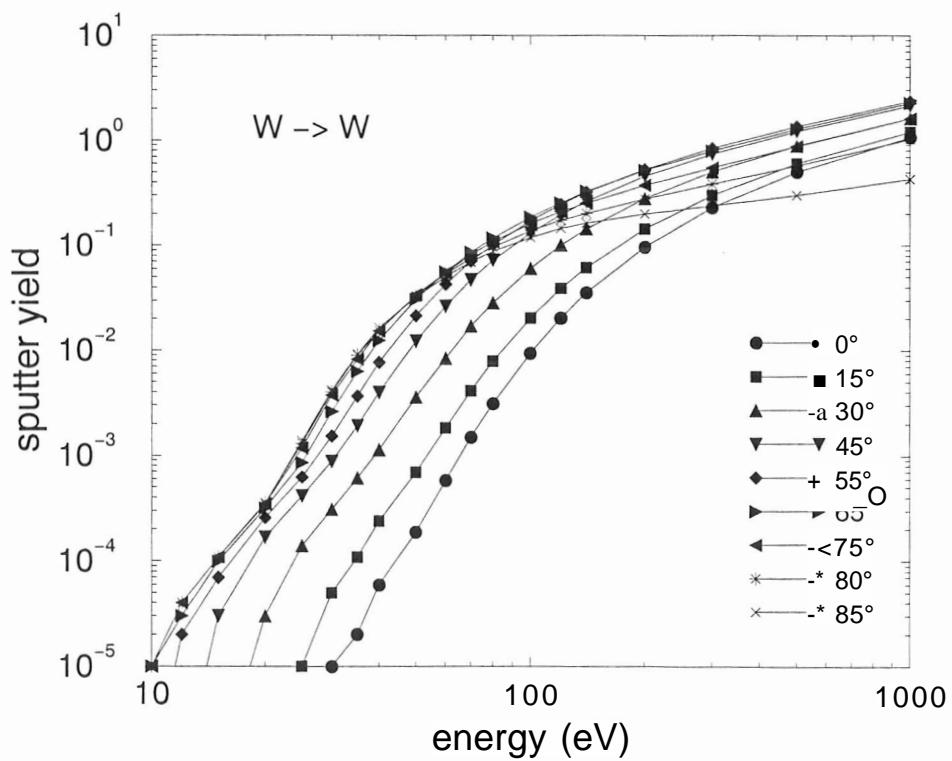
Sputtered energy of W by W

z1=74 , m1=183.85 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=18, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
12	.00000	.00000	.00000	.00000	.00000	.00000	.00001	.00001	.00001
15	.00000	.00000	.00000	.00000	.00001	.00002	.00002	.00002	.00002
20	.00000	.00000	.00000	.00002	.00004	.00005	.00006	.00007	.00007
25	.00000	.00000	.00001	.00005	.00010	.00016	.00024	.00027	.00029
30	.00000	.00000	.00003	.00012	.00025	.00050	.00080	.00089	.00094
35	.00000	.00001	.00006	.00027	.00062	.00125	.00187	.00206	.00216
40	.00000	.00002	.00012	.00057	.00133	.00257	.00355	.00371	.00405
50	.00001	.00005	.00038	.00183	.00391	.00658	.00821	.00837	.00826
60	.00003	.00014	.00093	.00397	.00783	.01216	.01387	.01375	.01302
70	.00008	.00031	.00185	.00718	.01306	.01855	.02002	.01904	.01798
80	.00017	.00058	.00301	.01091	.01847	.02550	.02659	.02438	.02275
100	.00050	.00142	.00615	.01899	.03022	.03937	.03855	.03414	.02976
120	.00100	.00258	.00969	.02718	.04180	.05205	.04811	.04153	.03495
140	.00167	.00382	.01315	.03518	.05242	.06392	.05608	.04693	.03783
200	.00403	.00773	.02255	.05305	.07617	.09046	.07480	.05725	.04063
300	.00809	.01336	.03326	.07163	.10210	.11820	.09480	.06751	.03979
500	.01406	.02102	.04474	.08993	.12480	.14630	.11860	.07937	.03762
1000	.02153	.02919	.05464	.10390	.14420	.17670	.15280	.10030	.03399
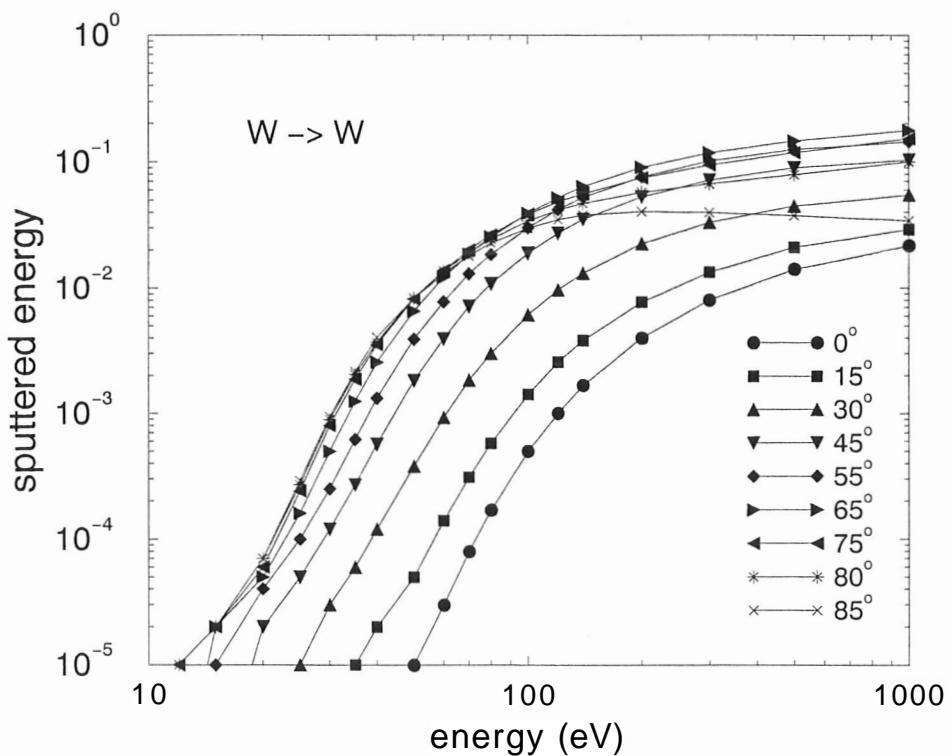
Particle reflection coefficient of W by W

z1=74 , m1=183.85 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=17, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00000	.00000	.00000	.00000	.00005	.00022	.00035	.00046
25	.00000	.00000	.00000	.00002	.00018	.00094	.00283	.00400	.00490
30	.00000	.00000	.00001	.00024	.00143	.00514	.01229	.01614	.01900
35	.00000	.00000	.00004	.00113	.00503	.01473	.03073	.03823	.04484
40	.00000	.00000	.00020	.00312	.01153	.03033	.05669	.06903	.08058
50	.00000	.00006	.00119	.01137	.03314	.07296	.12497	.15108	.16934
60	.00002	.00025	.00350	.02397	.06279	.12337	.20454	.24542	.27480
70	.00008	.00066	.00657	.03861	.09295	.17628	.28635	.33975	.38067
80	.00019	.00126	.01067	.05455	.12266	.22743	.36199	.42999	.47876
100	.00069	.00290	.01906	.08324	.17427	.31136	.49115	.57583	.63273
120	.00139	.00488	.02728	.10751	.21560	.37789	.58268	.67083	.73391
140	.00225	.00720	.03495	.12488	.24720	.42520	.64313	.73621	.79898
200	.00540	.01325	.05118	.15970	.29832	.49483	.72462	.82590	.89358
300	.01090	.02120	.06471	.17733	.31845	.51738	.76020	.86817	.93929
500	.01763	.02971	.07410	.18283	.31498	.50696	.76322	.88538	.96376
1000	.02462	.03712	.07744	.17010	.28546	.45764	.72728	.87364	.97612
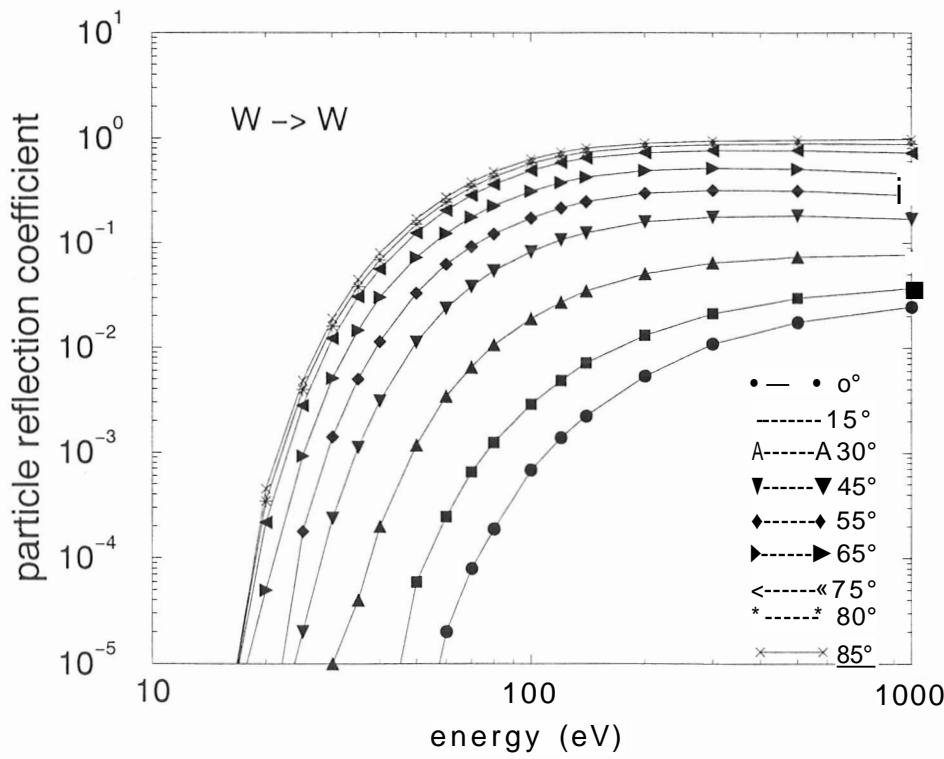
Energy reflection coefficient of W by W
z1=74 , ml=183.85 , z2=74 , m2=183.85 , Es=8.68 , rho=19.29 g/cm**3 ; ne=17, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
20	.00000	.00000	.00000	.00000	.00000	.00001	.00005	.00008	.00011
25	.00000	.00000	.00000	.00000	.00005	.00019	.00068	.00101	.00128
30	.00000	.00000	.00000	.00004	.00027	.00117	.00325	.00451	.00550
35	.00000	.00000	.00001	.00019	.00103	.00362	.00885	.01158	.01416
40	.00000	.00000	.00003	.00057	.00248	.00793	.01747	.02244	.02744
50	.00000	.00001	.00016	.00219	.00789	.02096	.04241	.05449	.06355
60	.00000	.00002	.00048	.00481	.01584	.03785	.07400	.09448	.11020
70	.00001	.00006	.00093	.00800	.02433	.05652	.10853	.13744	.16063
80	.00001	.00012	.00151	.01159	.03288	.07545	.14258	.18164	.21099
100	.00004	.00026	.00272	.01794	.04828	.10799	.20499	.25957	.30178
120	.00008	.00044	.00384	.02335	.06090	.13539	.25587	.32131	.37499
140	.00013	.00062	.00486	.02703	.07068	.15566	.29554	.37087	.43205
200	.00029	.00107	.00682	.03406	.08695	.19089	.36262	.46368	.54567
300	.00054	.00154	.00807	.03702	.09253	.20652	.40723	.53164	.64132
500	.00081	.00194	.00824	.03606	.08798	.20288	.42570	.57954	.72332
1000	.00103	.00217	.00777	.03025	.07320	.17364	.40435	.59111	.79045
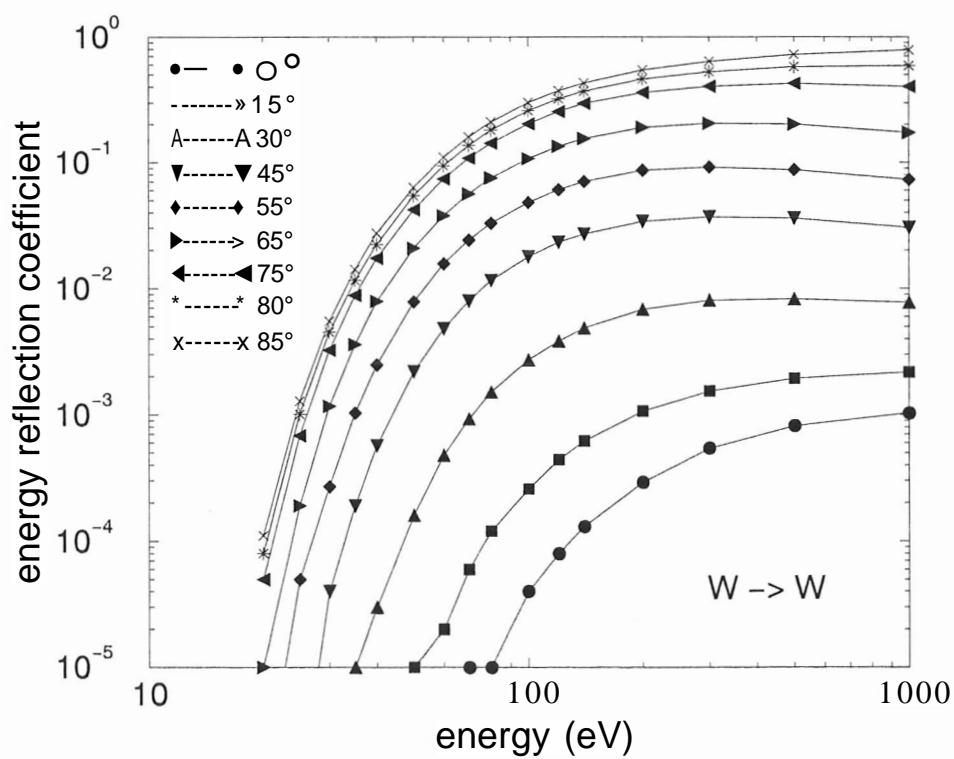
Average depth of implanted W in W
$z_1=74$, $m_1=183.85$, $z_2=74$, $m`_2=183.85$, $E_s=8.68$, rho=19.29 g/cm**3 ; ne=19, na=9

Eo(eV)	0°	15°	30°	45°	55°	65°	75°	80°	85°
10	0.7	0.7	0.6	0.5	0.5	0.4	0.4	0.4	0.4
12	0.9	0.8	0.7	0.6	0.6	0.5	0.5	0.4	0.4
15	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.5	0.4
20	1.3	1.3	1.1	0.9	0.8	0.6	0.5	0.5	0.5
25	1.6	1.5	1.3	1.1	0.9	0.7	0.5	0.5	0.5
30	1.8	1.7	1.5	1.2	0.9	0.7	0.6	0.5	0.5
35	2.0	1.9	1.7	1.3	1.0	0.8	0.6	0.5	0.5
40	2.2	2.1	1.8	1.4	1.1	0.8	0.6	0.5	0.5
50	2.5	2.4	2.1	1.6	1.3	0.9	0.7	0.6	0.5
60	2.8	2.7	2.3	1.8	1.4	1.0	0.7	0.6	0.6
70	3.1	3.0	2.6	2.0	1.6	1.2	0.8	0.7	0.6
80	3.4	3.2	2.8	2.2	1.7	1.3	0.9	0.7	0.7
100	3.8	3.6	3.2	2.6	2.1	1.6	1.1	0.9	0.8
120	4.2	4.0	3.6	2.9	2.4	1.9	1.3	1.1	0.9
140	4.6	4.4	3.9	3.2	2.7	2.2	1.6	1.3	1.1
200	5.5	5.3	4.8	4.1	3.5	3.0	2.2	1.8	1.5
300	6.7	6.5	6.0	5.2	4.6	3.9	3.1	2.6	2.1
500	8.6	8.4	7.7	6.8	6.1	5.4	4.4	3.8	3.0
1000	11.9	11.6	10.8	9.5	8.6	7.6	6.5	5.8	4.6