

**Particulate Matter in Diesel Engine Exhausts  
- a HREM and EELS Study**

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The particulate matter (soot) is one of the main adverse components of diesel exhaust gases. They are produced as an unwelcome byproduct during the incomplete fuel combustion and are serious threat to environment and human health. The development of lower particulate emission engine has been, and still is, the goal of automobile industry in UAS and European. Nowadays, through various engine modifications the soot emission of automotive has been decreased drastically (reduced by 35% in the Year 1999 in comparison to the year 1993).

Recently, we studied the microstructure, bonding state and morphology of soot particulates of an optimised EURO-IV diesel engine by means of HRTEM and EELS. The low-emission engine produces carbon particulates with an averaged size less than 15 nm. Core-shelled spherical primary particles are found as described in the literature, but more primary particles do not exhibit defined structure. The high-resolution imaging reveals fullerene-like clusters or molecules on the surface of the primary particles and can be, as polycyclic aromatic hydrocarbon and organic radicals, considered as possible nuclei and source for the formation of soot. EELS reveals the co-existence of  $sp^2$  and  $sp^3$  hybridisation of carbon atom in soot particulate.