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Self-Assembled Au-Nanoparticle/Organic Films and their Application as Vapor-Sensing Chemiresistors

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The use of metal-nanoparticle/organic composite films as chemical sensors has been suggested recently [1]. In such films the nanoparticles provide electric conductivity and the organic component provides sites for the interaction with analyte molecules. Here we describe the self-assembly fabrication of chemiresistors based on Au-nanoparticle/organic films, their characterization and vapor-sensing properties.

AFM- and TEM-measurements revealed films with well-controlled thickness (20 to 80 nm) and granular structures. XPS was used to characterize the chemical composition of the films. Charge transport measurements were consistent with an activated tunneling mechanism. Depending on the structure and size of the organic component, the conductivity could be tuned over several orders of magnitude.

The vapor-sensing properties of the films were probed by dosing them with solvent vapors while monitoring their conductance and the analyte uptake by microgravimetry. By using various bismercapto-compounds and polyfunctional dendrimers as the organic film component the chemical selectivity was tuned systematically [2,3].

The high sensitivity (< 10 ppm), the fast response (few seconds), and the well-controlled chemical selectivity make Au-nanoparticle/organic films promising candidates for sensor applications.

References

[1] *see for example:* Wohltjen, H.; Snow, A. W., *Anal. Chem.* **1998**, *70*, 2856
[2] Vossmeyer, T. et al., *Adv. Mater.* **2002**, *14*, 238;
[3] Krasteva, N. et al., *Nano Lett.* **2002**, *2*, 551