KOLLOQUIUM

Institut für Elektrotechnik, Elektronik und Informationstechnik

Nanostrukturierte Oberflächen

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Diskussionsleitung: Prof. em. Dr.-Ing. habil. Hans H. Brand

For the fabrication of nanostructured surfaces, electrochemical methods are strongly emerging. Some approaches represent simply a "wet" alternative to vacuum deposition techniques. In other cases unique features of electrochemical reactions are used for micro- and nanopatterning. Clear advantages of electrochemical reactions are that it is comparably easy and cheap to uniformly cover a non-planar substrate. Particularly, recently discovered special features such as "superfilling" have reached high significance in modern IC-technologies for via filling. In future, even more important may be the fact that many electrochemical processes are carried out at low temperatures and involve aqueous electrolytes. Both factors are of course extremely important whenever living (bio-organic) matter is involved - thus many view the solid/liquid interface as the interface of the future.

Lateral nano-structuring techniques employing an electrochemical process in conjunction with radiation (either to directly modify a surface or via a resist to transfer a pattern to the surface) must use radiation with a diffraction limit in the nm-range. Thus, short wavelength electromagnetic radiation of a sufficiently high energy (e.g., X-rays) or charged particle beams [electron beams (e-beam) or focused ion beams (FIB)] are main candidates. Other writing approaches that can be applied to obtain surface modifications with sub-mm resolution are based on scanning nano-probes, exploiting mechanical, force or field induced interactions of an extremely sharp tip with a surface. A most spectacular approach is based on (“natural”) self-organization of nanoscopic features. These features may be holes (pores) or bumps (atoms, molecules, nanospheres), and the reason for self-organization is often the existence competing reactions or effects. Self-organized structures may be directly created by electrochemistry or serve as templates for electrochemistry.

The presentation will focus on own research activities that explore new pathways to achieve chemical or electrochemical nanogrowth or -structurization of materials and several examples for applications will be given.