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S E M I N A R

aus

Halbleiterphysik und Nanotechnologie

Di, 25.11.2014, 11:00 Uhr
Hörsaal für Physik

"Advanced FIB / FEB Dual Beam Prototyping & Real Time AFM in Biology"

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This presentation is a brief overview about the scientific main activities of the "FIB and AFM Department" at the "Institute for Electron Microscopy" (Graz University of Technology; Austria) and focuses on: 1) soft matter processing via focused ion beams; 2) focused electron beam assisted fabrication of functional nanostructures; and 3) in-situ atomic force microscopy of enzymatic cellulose degradation.

The first part focuses on Focused Ion Beam (FIB) structuring of low melting materials (polymers, biological specimens, …) which often has been considered as almost incompatible due to the enormous local temperatures during processing. As will be shown in this overview, these high temperatures are not only caused by the intrinsic ion-matter interaction but also due to the standard process procedure itself. To eliminate this technically induced heating, alternative patterning strategies are introduced which considerably reduce the thermal stress for the sample and successfully decrease morphological and chemical degradation.

In the second part, emphasis is placed on Focused Electron Beam Induced Deposition (FEBID) as direct-write method for the fabrication of functional 3D – nanostructures. The overview addresses purity issues which led to a bad reputation during the last decade and demonstrate how pure metal deposits on the lower nanoscale can be fabricated. Furthermore, two sensor concepts are briefly discussed which are based on the unique metal-matrix composition of FEBID materials.

The last part of the presentation is focused on real-time Atomic Force Microscopy (AFM) investigations of biological systems in liquid environments. In this section, the necessity of nano-flat and fully tunable model-substrate is discussed at the beginning together with latest developments towards artificial close-to-nature substrates. Furthermore, the new high-speed AFM instrumentation at the FELMI and its capabilities is introduced which opens entirely new possibilities for high-speed real-time investigations down to molecular resolution.