

Nanostructuring surfaces with slow multiply charged ions

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With the shrinking of semiconductor devices surface features and structuring become increasingly important.

Generally, fast ions are used for modification of surfaces via ion beam writing. Their kinetic energy is not only dissipated close to the surface but also in deeper layers of the material. Associated radiation damage could become a problem in the production of novel 3D MEMS and NEMS.

Slow (<1keV) multiply-charged ions are a new tool for gentle structuring of surfaces at the nanometer-scale [1]. The substrate is modified only at and slightly below the surface, opening the possibility of controlling electronic properties at the nanometer scale, vertically and horizontally.

Materials under investigation are HOPG [2], single crystal isolators (quartz, mica, aluminum oxide) [3], hydrogen-terminated single-crystal silicon [4], AsSe- and Se-glass and mylar foils [5].

The materials modified by multiply-charged ion irradiation are investigated with scanning probe microscopy (AFM, STM, MFM) in ultrahigh vacuum and in ambient conditions for their nanometer-scale topographic, magnetic and electronic properties.

Keywords: slow ions; gentle nanostructuring; controlling electronic properties

References

- [1] G. Hayderer, S. Cernusca, M. Schmid, P. Varga, HP. Winter, F. Aumayr et al., *Phys. Rev. Lett.* **86**, 3530 (2001).
- [2] I.C. Gebeshuber, S. Cernusca, F. Aumayr and HP. Winter, *Int. J. Mass Spectrom.* **229**, 27 (2003).
- [3] I.C. Gebeshuber, S. Cernusca, F. Aumayr and HP. Winter, *Nucl. Instr. Meth. Phys. Res. B* **205**, 751 (2003).
- [4] R.A.P. Smith, I.C. Gebeshuber, S. Pleschko, K. Kaska, HP. Winter and F. Aumayr, *Abstract ECASIA*, Vienna, Austria (2005).
- [5] M. Fuersatz, S. Pleschko, I.C. Gebeshuber, HP. Winter, C. Lemell, N. Stolterfoht and F. Aumayr, *Abstract ICPEAC*, Rosario, Argentina (2005).