Scanning Tunneling Microscopy of Compounds with a Layer-Type Structure

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of the spreading method make it possible to map specific regions with a precision of about 50 nucleotides with a minimum of material. Special methods have been developed for the study of protein DNA interactions. A direct visualization of complexes is possible but also the analysis of protein-induced structural changes in DNA such as bending and looping. Some useful applications of nucleic acid electron microscopy are shown and some drawbacks discussed.

SCANNING TUNNELING MICROSCOPY OF COMPOUNDS WITH A LAYER-TYPE STRUCTURE

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The principal aim of this research project is the investigation of the atomic structure of interfaces which are of great importance to materials science and technology. The main experimental tool explored is a scanning tunneling microscope. Scan sizes of scanning tunneling microscopes with atomic resolution are of the order of 1 μm. In order to locate interfaces it is necessary to be able to scan sample surfaces having mm dimensions. For this reason, a STM unit is currently being built inside a scanning electron microscope. UHV conditions are given special attention, for which purpose a sample chamber is under design, pumped by a Ti-sublimation unit.

In air, the surface of cleaved TiS_2 is being investigated. The material was made by the laboratory of Inorganic Chemistry of the university. This has led to images having atomic resolution which revealed two different kinds of isolated defects with three-fold symmetry. The first consists of a triangle of 15 highlighted atoms, the second of a triangle of three highlighted atoms surrounded by three missing spots. These two phenomena occupy opposite crystallographic sites in the hexagonal surface lattice.

IMPROVED EPON EMBEDDING FOR BIOMATERIALS

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To obtain improved transmission electron microscopy sections for cell biological and interface evaluation of implanted biomaterials we present an improved embedding procedure. Standard problems in preparation and sectioning, like dissolution of the biomaterial, or holes and chatter in the sections, can be prevented by introducing butyl-2,3-epoxypropylether as an intermedium between the dehydration series and the Epon resin. Most biomaterials were not affected by this chemical agent. The introduction of butyl-2,3-epoxypropylether resulted in completely homogeneous Epon blocks which enabled us to cut 50 nm sections, free of holes and chatter. The biomaterials did not dislodge during the process of sectioning, and the cell-polymer interface remained intact for electron microscopical evaluation.

AN ULTRA-HIGH-VACUUM CHAMBER FOR A PHILIPS EM430 STEM

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At the Delft Particle Optics group a new Scanning Transmission Microscope based on the Philips EM430 is under design. With this microscope it will be possible to do Auger spectroscopy. With the help of a parallelising field the Auger electrons will be guided from the sample to the energy-dispersive 180° electrostatic analyzer. Because of the combination of the high spatial resolution of the STEM and the large acceptance angle of the spectrometer this instrument will be a powerful surface analytical instrument. However, to do Auger spectroscopy one needs to have a clean surface. This means the vacuum at the sample position must be in the 10^{-10} Torr range or lower. To obtain this vacuum the whole objective lens region is redesigned: All elastomere O-rings have been taken out, the pole pieces will be connected to the stainless steel vacuum chamber with a combined soldering and welding seal, the whole chamber will be sealed with Conflat seals and pumping will be done completely oil-free with an Iongetter pump and two Ti-sublimation pumps. UHV is not only important for surface analysis and material science,