

Short scientific report on the short visit of
Ing. Mag. Stefan Jaksch
at the group of prof.dr.ir. H.J.W. Zandvliet

Purpose of the visit

The production of different Nanoparticles via a magnetron sputter-source is a quite simple way, to get ultrathin films with unique properties. These films are very stable and can be used to imprint different patterns in the nanometer regime via scanning specific areas with a Scanning Tunneling Microscope. Up to now we could perform only STM-topographs. To get a better insight in this nanolithography-processes Scanning Tunneling Spectroscopy is needed. With this powerful STS technique it would be possible to determine the underlying effect of changing the Nanoparticle-film in the scanned areas. For this purpose a stay at the group of Prof. Zandvliet, a specialist in Scanning Tunneling Spectroscopy (STS) for large-band-gaps-materials would be very helpful for our ongoing measurements in Innsbruck to answer the presently open questions.

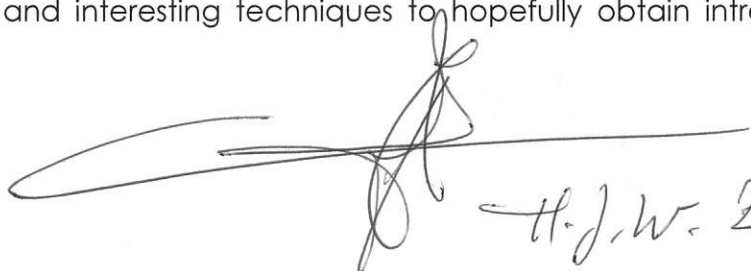
Description of the work carried out during the visit and main results

The first 2 days were used to get familiar with the spectroscopy technique. Therefore different measurements were performed with an ambient air STM. Several IZ-spectroscopy curves were measured and the inverse decay length of HOPG and gold could be obtained. Due to some problems with the electronics / software we could only get values for one polarity of the bias voltage.

The second part of the week measurements on Platinum coated Germanium were carried out with a Omicron room temperature UHV STM. STS measurements (IV-curves) have been obtained on pure Ge(001) terraces and on Platinum Nanowires adsorbed to the Ge(001) surface. In addition also time-spectroscopy was performed on the Ge(001) sample. This rather new technique is very useful to determine dynamics of dimers or even clusters on a surface. This technique is very useful for already planned future measurements with biomolecules and explosives.

Some time was also spent just for working with a lock-in-amplifier. To get a feeling for how this device works and how it should be used. This extended introduction was very helpful, we also discussed the right way to combine a lock-in-amplifier with the STM. This is the main requirement to record spatial maps of the differential conductivity. These maps include very important information in addition to the 'normal' STM-topography-images. Due to lack of time it was not possible to perform some measurements of spatial maps, because these are very sensitive measurements that take long time.

All over all, in this week I got a very interesting insight into the amazing things one can achieve by using a simple STM (with some tricks) 'in the right way'. All the knowledge I could collect in this short time is very useful for the actual studies on Nanoparticle films. Even for the single molecule studies which will follow after the Nanoparticle films I got very good ideas and interesting techniques to hopefully obtain interesting and novel results.


H.J.W. Zandvliet
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