AFM / STM imaging at 300 mK and 9 Tesla

attocube systems is now manufacturing AFM / STM microscopic inserts in combination with He3 systems for investigations at ultra low temperatures down to 300 mK as well as high magnetic fields.

The attoAFM III, implemented with a non-optical tuning fork sensor, and the attoSTM I are the newly released scanning probe microscopes completing the series of attocube systems' low and ultra low temperature SPM systems. The implemented ANPxyz101 coarse positioning unit allows to access any sample region of interest within an area of 5 x 5 mm. The guiding axes of these coarse positioning devices are suspended with flexible membranes leading to a higher stability of the overall setup and consequently to improved resolution. attocube systems has also realized an efficient vibration isolation by using spring suspension and additionally the cryogenic unit is isolated against acoustic noise.

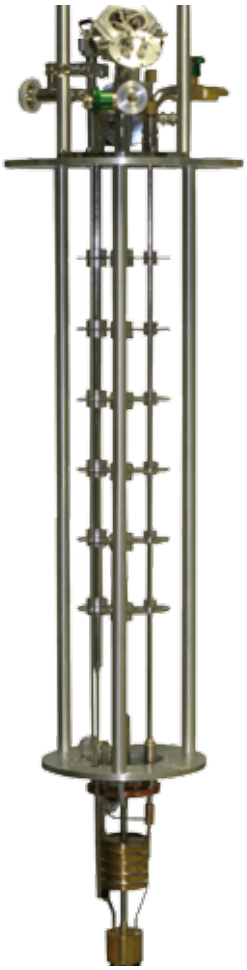

Figure 1 and Figure 2 present the non-contact mode AFM data of a Si/SiO_2 grating recorded at 320 mK and 7 T using the attoAFM III. Due to the non-optical shear force detection based on the tuning fork mechanism, this system is ideally suited for applications where input of light is problematic. A typical application is e.g. Scanning Gate Microscopy (SGM) on semiconductor structures. Alternatively, the commercially available Akiyama probe can be used in this setup.
Figures 3 shows STM results when imaging an HOPG surface with atomic resolution at room temperature as well as at 310 mK and 9 T. No filters have been applied for further image processing.

Currently attocube systems is setting up a complete system combining the ultra stable attoAFM I module with a dilution refrigeration unit for measurements down to the mK-regime. As the pre-cooling is performed using a cryogen free pulse tube cooler, no liquid Helium will be required.

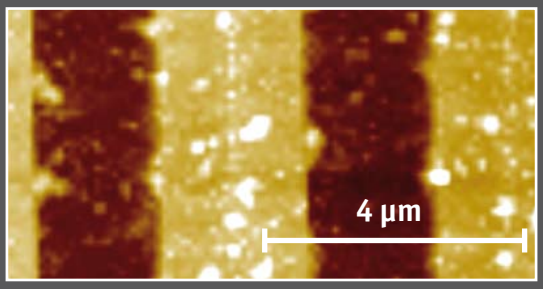

Fig. 1: Non-contact mode image using the attoAFM III in combination with the non-optical tuning fork sensor recorded at 320 mK and 7 T (Si/SiO_2 sample, grating height 20 nm, attocube application labs, 2007).

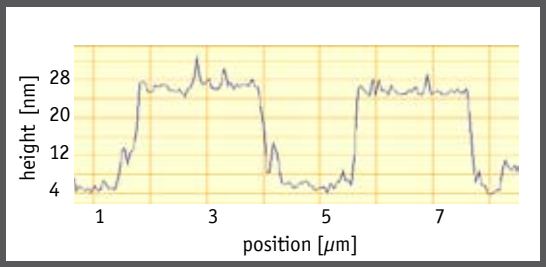

Fig. 2: AFM height profile data of the Si/SiO_2 sample with a grating height of 20 nm recorded at 320 mK and 7 T (attocube application labs, 2007).

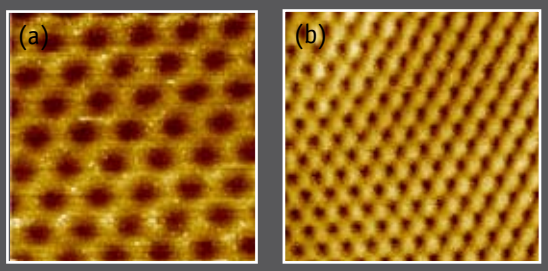

Fig. 3: Atomic resolution image of an HOPG surface recorded at (a) room temperature and (b) 310 mK and 9 T; (attocube application labs, 2007).

RELATED PRODUCTS

attoAFM III	low temperature atomic force microscope, tuning fork sensor
attoSTM I	highly stable and compact scanning tunneling microscope
ASC500	SPM controller
ANC250	scan voltage amplifier for piezo scanning tubes, ultra low noise
LTSYS-He3	Low Temperature Physics Measurement System combined with a He3 insert

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