STM IMAGING OF MAGNETIC DOTS WITH FERROMAGNETIC TIP

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9.7 cm

Imaging of isolated nanoscale magnetic dots in magnetic external field by the use of a scanning tunneling microscope (STM) equipped with a ferromagnetic Co tip was studied. The experiment relied on recording the topographic images in the same tunneling conditions in the constant current mode of STM. The magnetic field was only a parameter being changed. Next, the apparent height of dots was determined from the section analysis. No changes in apparent height with magnetic field were detected for small Ni and Co dots. Contrary, for bigger objects (above 1 nm in height and several nanometers in diameter) the dependence of apparent height with magnetic field was very clear. It took hysteresis like shape. Possible artefacts were excluded by the height measurements of silicon step, which was used as a specimen of nonmagnetic object. Its height remained unchanged in the whole range of magnetic field, as expected. Therefore we suggest the observed dependence of apparent height to be of magnetic nature. This is a result of mutual magnetic vector rotation in the STM tip and magnetic dot as magnetic field was applied. It seems however that not only spin polarised tunneling effects are involved. Also magnetoelastic properties of dots might play an important role. The lack of apparent height dependence for small dots was probably due to their superparamagnetic character.

13.4 cm

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