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U. Memmert, U. Hodel, and U. Hartmann
TUNNELING MICROSCOPY MODIFICATION OF Ag THIN FILMS ON Si(100): LOCAL REARRANGEMENT OF THE Si SUBSTRATE BY Ag/Si EUTECTIC PHASE FORMATION

The melting, eutectic alloy formation, and evaporation, induced locally by a scanning tunneling microscope, was studied for 20 nm Ag films, deposited on hydrogen-terminated Si(100) surfaces. The Ag thin film can be locally rearranged or evaporated with a lateral resolution of 100–150 nm. For long interaction durations 50–70 nm wide and 30 nm deep, grooves could also be cut into the Si substrate. The modification mechanism can be explained by a model involving local melting, alloy formation, and evaporation.

*Proc. NANO IV Conf., Beijing, China, 1995; J. Vac. Sci. Technol. B **15**, 1346 (1997)*

R. Houbertz, W. Krauss, R. Birringer and U. Hartmann
XRD AND SXM INVESTIGATIONS ON NANOCRYSTALLINE PbS

We have performed XRD and scanning tunneling/atomic force microscopy (STM/AFM) measurements on nanocrystalline PbS. The PbS particles, which were produced by the inert gas condensation method were either deposited on substrate surfaces or compacted into macroscopic samples. The XRD measurements performed on powders as well as on compact pellets show that the resulting material consists only of the ordered cubic crystalline structure of PbS. The AFM measurements on PbS covered substrates show agglomerates which could be resolved by STM. The agglomerates are composed by small PbS nanocrystals, exhibiting a grain size of approx. 5 nm. The electronic properties of these ultrasmall grains should thus involve pronounced quantum phenomena.

*Proc. 9th Intern. Conf. on NanoStruct. Mat., Kona, USA, 1996; NanoStruct. Mat. **9**, 339 (1997)*

Th. Feigenspan, R. Houbertz and U. Hartmann
AFM INVESTIGATIONS OF AU55 CLUSTERS ON VARIOUS SUBSTRATES

We have investigated the adsorption of ligand-stabilized Au55 clusters on highly oriented pyrolitic graphite (HOPG) and H-terminated Si(111) surfaces by atomic force microscopy (AFM). The cluster powder, which was produced by a wet chemical process, was solved in dichlormethane and subsequently brought onto the substrates. The concentration of the solution was varied between saturation and a dilution to approx. 10 % of a saturated solution. The patterns produced by the adsorbed Au55 clusters on the HOPG surfaces show a very inhomogeneous morphology, whereas the adsorption of Au55 clusters onto H-terminated Si(111) surfaces leads to a very homogeneous morphology.

*Proc. 9th Intern. Conf. on NanoStruct. Mat., Kona, USA, 1996; NanoStruct. Mat. **9**, 367 (1997)*

V. Weidenhof, F. Gropper, U. Müller, L. Marosi, G. Cox, R. Houbertz and U. Hartmann
MORPHOLOGICAL INVESTIGATIONS ON MESOSTRUCTURED METAL OXIDES

The synthesis and characterization of mesostructured zirconia and titanium oxides are presented. The samples were investigated by x-ray powder diffraction (XRD), transmission electron microscopy (TEM), and atomic force microscopy (AFM). XRD and TEM revealed only lamellar structures for both materia1s, whereas AFM could detect locally restricted initial stages of cubic or hexagona1 phases in a globally lamellar Ti oxide.

J. Mat. Research ***12****, 1634 (1997)*

C. Horstmann, P. Leinenbach, A. Engelhardt, R. Dittmann, U. Memmert, U. Hartmann and A.I. Braginski
CORRELATION BETWEEN RAMP MORPHOLOGY AND PROPERTIES OF RAMP-TYPE JUNCTIONS
Proc. ASC, Pittsburgh, USA, 1996; IEEE Trans. Appl. Supercond. ***7****, 2844 (1997)*

R. Euler, U. Memmert and U. Hartmann
FIBER INTERFEROMETER-BASED VARIABLE-TEMPERATURE SCANNING FORCE MICROSCOPE

A scanning force microscope designed for an operation at temperatures between 4.2 and 300 K is presented. The deflection of the microfabricated force sensing cantilever is detected via an optical fiber interferometer. For low temperature imaging the whole instrument is incorporated into a bath cryostat which is suitable for both liquid helium and liquid nitrogen cooling. The instrument is of highly symmetric design in order to avoid large inner misalignment of the interferometer due to thermal expansion/contraction during temperature changes. In addition to this thermally compensated design, the interferometer can be adjusted by piezo actuators in situ in three dimensions.

Rev Sci. Instrum. ***68****, 1776 (1997)*

C. Mathieu, C. Hartmann, M. Bauer, O. Buettner, S. Riedling, B. Roos, S. O. Demokritov, B. Hillebrands, B. Bartenlian, C. Chappert, D. Decanini, F. Rousseaux, E. Cambril, A. Müller, B. Hoffmann, and U. Hartmann
ANISOTROPIC MAGNETIC COUPLING OF PERMALLOY DOTS FORMING A SQUARE LATTICE

Static magnetic and spin wave properties of square lattices of permalloy micron dots with thicknesses of 500 and 1000 Å and with varying dot separations have been investigated. A magnetic fourfold anisotropy was found for the lattice with dot diameters of 1 μm and a dot separation of 0.1 μm. The anisotropy is attributed to an anisotropic dipole–dipole interaction between magnetically unsaturated parts of the dots. The anisotropy strength (order of 10^5 erg/cm^3) decreases with increasing in-plane applied magnetic field.

Appl. Phys. Lett. ***70****, 2912 (1997)*

B. Hillebrands, C. Mathieu, C. Hartmann, M. Bauer, O. Buettner, S. Riedling, B. Roos, S. O. Demokritov, B. Bartenlian, C. Chappert, D. Decanini, F. Rousseaux, E. Cambril, A. Müller, B. Hoffmann, and U. Hartmann
STATIC AND DYNAMIC PROPERIES OF PATTERENED MAGNETIC PERMALLOY FILMS

Static magnetic and spin-wave properties of square lattices of permalloy micron dots with thicknesses of 500 Å and 1000 Å and with varying dot separations have been investigated. The spin-wave frequencies can be well described taking into account the demagnetization factor of each single dot. A magnetic fourfold anisotropy was found for the lattice with dot diameters of 1 μm and a dot separation of 0.1 μm. The anisotropy is attributed to an anisotropic dipole-dipole interaction between magnetically unsaturated parts of the dots. The anisotropy strength (order of 10^5 erg/cm^3) decreases with increasing in-plane applied magnetic field.

Toyota Workshop on Information Storage Materials, Brussels, Belgium, 1997, J. Magn. Magn. Mater. ***175****, 10 (1997)*

U. Hartmann
AN INTRODUCTION TO ATOMIC FORCE MICROSCOPY
(TopoMetrix, Santa Clara, 1997)

U. E. Volmar, U. Weber, R. Houbertz and U. Hartmann
ELECTRONIC TRANSPORT IN A SERIES OF MULTIPLE ARBITRARY TUNNEL JUNCTIONS

Monte Carlo simulations and an analytical approach within the framework of a semiclassical model are presented which permit the determination of Coulomb blockade and single electron charging effects for multiple tunnel junctions coupled in series. The Coulomb gap in the I(V) curves can be expressed as a simple function of the capacitances in the series. Furthermore, the magnitude of the differential conductivity at current onset is calculated in terms of the model. The results are discussed with respect to the number of junctions.

Physica B 240, ***38*** *(1997)*

U. Hodel, U. Memmert and U. Hartmann
A COMBINED ULTRAHIGH VACUUM SCANNING TUNNELING - SCANNING ELECTRON MICROSCOPE SYSTEM
Proc. 9. Arbeitstagung Oberflächenanalytik, Aachen, 1996; Fres. J. Anal. Chem. ***358****, 77 (1997)*

P. Pitzius, V. Dworak, and U. Hartmann
ULTRAHIGH-RESOLUTION SCANNING SQUID MICROSCOPY
Proc. ISEC´97 Conf., Berlin, Germany, 1997

U. Hartmann
AUF DER SCHWELLE ZUR NANOTECHNOLOGIE (Teil 2)
*Magazin Forschung **1**, 2 (1997)*

A. Drechsler, P. Pitzius, and U. Hartmann
TUNING OF HIGH-Tc SQUIDS BY AFM
Appl. Phys. A. (submitted for publication)