Research Profile

We aim at studying how the physics of objects looks like if one or more spatial dimensions are reduced to a few 1000 atoms (mesoscopic scales) down to a few atoms (nanoscale).

The combination of magnetism with nanostructures opens the possibility of exploiting the electrons' spin degree of freedom for so-called spintronic devices with optimized properties or new functionalities. The group has a strong expertise in the development of new instruments for imaging of spintronic devices which operate at the highest spatial and/or temporal resolution. One example of such a technique is Scanning Field Emission Microscopy with Polarization Analysis (SFEMPA), which combines the high spatial resolution of a Scanning Tunnelling Microscope with the spectroscopic and spin analysis capabilities of secondary electrons emitted in conventional scanning electron microscopy.

Another recent achievement of the group was the detailed and possibly universal understanding of the spin structure of perpendicularly magnetized ultrathin ferromagnetic films, for which modulated phases in the form of striped phases were detected.

Competences / Infrastructure

- SFEMPA imaging, local excitation of secondary electrons from a tip with the aim of imaging the magnetic texture with near atomic spatial resolution
- Scanning Tunnelling Microscopy, SFEMPA and in-situ Scanning Electron Microscopy with Polarization Analysis for determining the correlation between magnetic, structural, and chemical properties at the nanoscale
- Simulation of electromagnetic fields at various spatial scales for development of advanced instrumentation
- Fabrication of single crystalline magnetic micro- and nanostructures (thickness of a few atomic layers) by molecular beam epitaxial growth

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The Experimental Physics Group is part of the Competence Center for Materials and Processes (MaP). MaP brings together about 80 groups with research activities in the area Materials and Processes at ETH Zürich. More information at www.map.ethz.ch

chemical imaging | surfaces | magnetic imaging | thin films | topographic imaging | spintronics