Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

PhD position available —

Imaging the magnetic domain structure of rare-earth metal films

Experimental Physics 2 (EP2), University of Würzburg (Germany)

Our research group performs spin-polarized scanning tunneling microscopy (SP-STM) measurements to investigate the magnetic domain structure. The microscopes are operated at low temperatures (typically cooled by liquid helium), housed by ultra-high vacuum chambers, and usually operated by small teams consisting of 2–3 master or graduate students and postdocs.

In a research project funded by DFG (German Research Foundation) we are currently interested in the domain structure of rare-earth metal films. Surprisingly, only little is known about the 12 spin-carrying elements of the 4f group (ranging from Cerium with atomic number Z = 58 to Ytterbium, Z = 70). Although rare-earth metals are used in numerous applications, like permanent magnets, in the literature only reports for Gadolinium (Gd) [1], Dysprosium (Dy) [2], and Neodymium (Nd) [3] can be found. Recently, we studied the Gd where we found a spin-reorientation transition from in-plane to out-of-plane which goes along with an astonishingly complex domain structure (see some data below). During the project the surface spin structure of other, yet unstudied rare-earth metals shall investigated.

We offer: Well-equipped laboratories. Gross salary of about 2.100 €/per month in year 1 up to about 3.000 €/per month in year 3.

Prerequisites: Broad understanding of solid-state physics phenomena; experience with ultra-high vacuum equipment, surface science, and/or scanning tunneling microscopy

References: [1] P. Härtl, M. Leisegang, and M. Bode, Phys. Rev. B 105, 174431 (2022)
[2] L. Berbil-Bautista, S. Krause, M. Bode, and R. Wiesendanger, Phys. Rev. B 76, 064411 (2007)
[3] U. Kamber, et al., Science 368, eaay6757 (2020)

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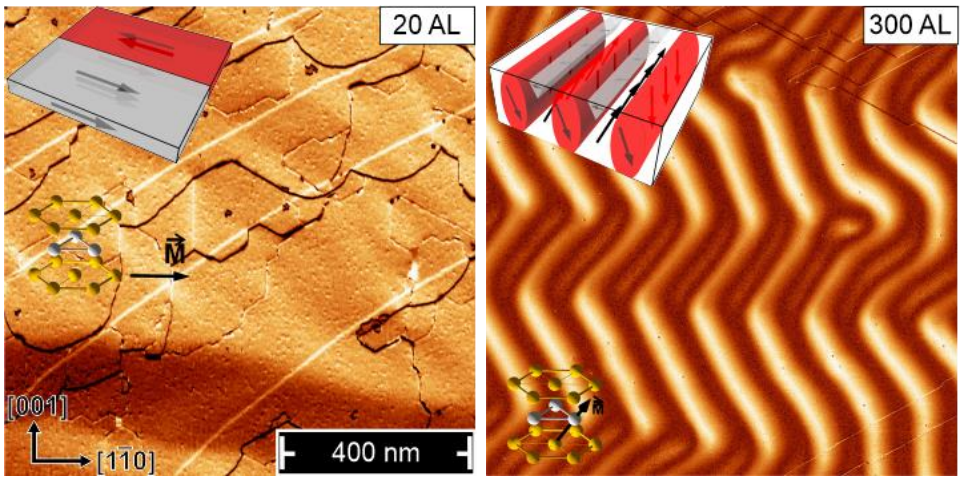

Spin-polarized STM images of the magnetic domain structure of Gd films on W(110) at film thickness of 20 atomic layers (left) and 300 atomic layers (right). Schematic representations are shown in the upper left.