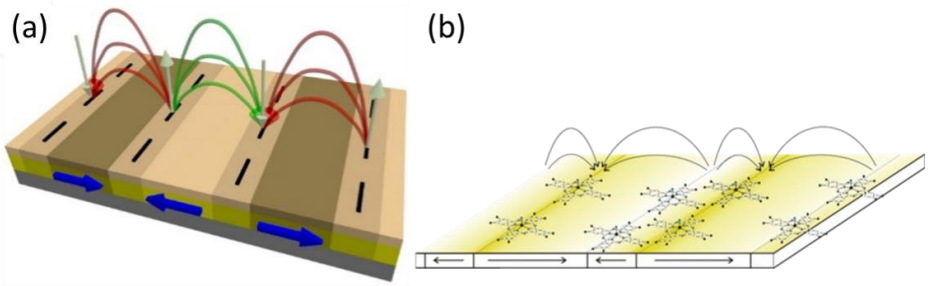
PhD position: Magnetic domain landscapes for lab-on-a-chip applications explored with neutron scattering

Field of expertise: Magnetic Thin Films, Magnetic Colloids, Polarized Neutron Scattering
Work Places: Kassel University, Germany; Institut Laue-Langevin (ILL), Grenoble, France
Abstract:
We are seeking applications for a PhD project in collaboration between the University of Kassel, Germany, and the Institute Laue-Langevin, France. The goal of this project is to characterize the guided assembly and movement of magnetic particles on tailored magnetic domain patterns for lab-on-a-chip applications using neutron scattering techniques.



Engineered magnetic stripe domain pattern with emerging tailored stray fields (a) and potential application e.g. for the controlled assembly of magnetic molecules (b).

The domain patterns are engineered by light-Ion bombardment-induced magnetic patterning (IBMP), allowing the generation of diverse magnetization configurations in exchange bias (EB) thin film systems. Magnetic domain walls in the patterns are sources of a magnetic stray field landscape, allowing for the capture and transport of magnetic particles inside a liquid. The topographically flat nature of the structures and the freedom to create almost arbitrary geometries result in a high application potential for lab-on-a-chip technologies, for example in medical diagnostics. Using state-of-the-art fabrication and characterization techniques, the project's main objectives are understanding the magnetic textures and the dynamic assembly of particles on top of them.

In year 1 of the project, at *Kassel University* (Germany), the candidate will fabricate and pre-characterize the thin film templates and domain patterns by magnetron sputtering, lithography, light-ion bombardment, and Kerr-/Vibrating sample-magnetometry. Years 2 and 3 of the project will take place at the *ILL* in Grenoble (France), where he/she actively proposes, conducts, and analyses polarized neutron reflectometry measurements on the D17 beamline, characterizing the spin configurations of the domain patterns. In collaboration with the sample environment team, a microfluidic cell will be designed that enables the in situ analysis of in-liquid actuation of magnetic particles. Based on the results, the Kassel team will assist with fabrication of new samples during years 2 and 3 of the project.

We are looking for a highly motivated candidate with an M.Sc. degree in physics or material science. Prior experience in magnetic thin film fabrication, characterization, or neutron reflectometry will be an advantage. The candidate will work in a collaborative environment at cutting-edge research facilities.

How to apply: Please send an email to *Prof. Arno Ehresmann* (ehresmann@physik.uni-kassel.de) and *Dr. Thomas Saerbeck* (saerbeck@ill.fr) including your CV, a short motivation letter, your Bachelor/Master certificate, a short summary of your master thesis and a contact person for reference. For further information contact Prof. Ehresmann, your academic supervisor at Kassel University or Dr. Saerbeck, your supervisor at ILL.

Additional details about the specific conditions for the PhD position and the application procedure can be found on the ILL website: https://www.ill.eu/careers/all-our-vacancies/phd-recruitment/open-phd-positions