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Static and dynamic local magnetic fields for positioning and controlled movement of small objects

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Artificial magnetic domain patterns can be fabricated in exchange biased bilayers and some other magnetic multilayer systems by light-ion bombardment induced magnetic patterning (keV He^+ ion bombardment in combination with resist masks and an applied magnetic field during the bombardment). This technique enables a local modification of, e.g., the exchange bias field in magnitude and in direction. Remanently stable magnetic patterns (artificial domains) may be created without large changes in surface topography. These patterns allow also a tailoring of the associated magnetic strayfield landscapes due to tailored magnetic charges at domain walls. The fundamentals for fabricating such artificial domain patterns will be discussed. The corresponding stray fields may be dynamically changed by overlaid external macroscopic magnetic fields or by a controlled domain wall motion. The use of the associated static and dynamic magnetic field landscapes for positioning of molecules and for the controlled movement of superparamagnetic particles by moving domain walls will be shown and their possible application in a lab on a chip device will be discussed. Besides the application point of view experiments on fundamental aspects of particle transport on or close to surfaces will be presented.

Biography

Arno Ehresmann has completed his Ph.D. in Experimental Atomic Physics at the age of 29 from The University of Kaiserslautern, Germany. Postdoctoral studies on molecular photoionization and dissociation followed at Tokyo Institute of Technology and a position as vice president R&D systems technology and project manager at Deutsche Babcock Turbo-Lufttechnik, (wind tunnel instrumentation and solar simulation systems). He is now Professor of Experimental Physics at The University of Kassel and Director of the Center for Interdisciplinary Science and Technology (CINSaT) with 28 individual groups working in the nano sciences. He has published more than 140 papers in peer-reviewed journals.

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