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Magnetic Dipole Interaction on a Square Lattice[1] HARTMUT ZABEL, MELANIE EWERLIN, DERYA DEMIRBAS, FRANK BRUESSING, Ruhr-Universitaet Bochum, FLORIAN KRONAST, Helmholtz-Zentrum Berlin —
We have studied interactions and phase transitions of circular magnetic islands with dipole character on a square lattice. By lithographic means we have prepared square patterns of periodicity 300 nm decorated with circular islands of 150 nm diameter using Pd0.87Fe0.13 as magnetic alloy. Below the Curie temperature of 260 K each island is in a ferromagnetic, single domain state with dipolar character and zero in-plane anisotropy. Below a second transition temperature the dipoles start to interact. MOKE measurements show a characteristic change in the magnetic hysteresis for temperatures below 160 K with increasing coercivity for decreasing temperatures. Furthermore, below the second transition the in-plane hysteresis becomes anisotropic, having an easy axis along [10] direction and a hard axis along [11] direction. SPEEM experiments at BESSY II of the HZB with circularly polarized incident photons tuned to the Fe L3 - edge show clearly the development of dipolar chains below the second phase transition that increase in length with decreasing temperature. Neighbouring chains are found to be oriented parallel as well as antiparallel.

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