Kerr microscopy - possibilities and limitations

Jeffrey McCord, j.mccord@ifw-dresden.de Leibniz Institute for Solid State and Materials Research Dresden - IFW Dresden, Germany

Important for the understanding of the origin of magnetic properties and technological application of magnetic materials is the ability to observe the magnetic domain and domain wall structure. One method, practiced since decades, is magneto-optical wide-field Kerr microscopy using conventional imaging optics. The domain contrast in the image is directly sensitive to the magnitude and direction of magnetization. Arbitrary magnetic fields can be applied during observation, so that domain nucleation and magnetization processes can be observed easily. Possibly the utmost advantage over other domain observation methods is the speed and time-resolution in which images can be acquired. Disadvantageous is the limited lateral resolution.

The versatility and possibilities of Kerr microscopy will be illustrated on various examples. These include regular quasi-static imaging, quantitative domain analysis, and layer resolved imaging on extended and patterned magnetic thin films, magnetic multilayers, spring magnets, and exchange biased systems. Additional examples of slow dynamics, like creep induced magnetic reversal processes of up to several minutes, and fast dynamics of the high-speed reversal in the sub-ns time-regime will be shown. The latter are obtained using two different stroboscopic imaging set-ups. One is based on a gated camera with variable time resolution down to 200 psec, the other on a pulsed laser illumination source with 20 psec time resolution.

Connections between measurable magnetic properties and the magnetic microstructure will be made.

