edited by

Rosa A. Lukaszew

Handbook of Nanomagnetism

Applications and Tools

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Preface

Nanomagnetism comprises magnetic phenomena in matter where at least one dimension is in the nanoscale, i.e., in the range from 1 to 100 nm. This field includes the study of the properties and applications of magnetism in nanoparticles, nanodots, nanowires, thin films, and multilayers, and also macroscopic samples that contain nanoscopic particles. Applications of nanomagnetism range from spintronics—i.e., manipulation, storage, and transfer of information by means of electron spins—to biosensors as well as medical applications.

Nanomagnetism has been able to stimulate applied as well as fundamental research, particularly in magneto-transport as well as magneto-optical properties of nano-size materials. In particular, spin tunneling properties are exploited in spintronic applications and are a unique tool for surface imaging as in spin-polarized scanning tunneling microscopy.

Thus, this book compiles the work of leading researchers specializing in spintronics, particularly spin transfer torque (STT) and its application to next-generation MRAM (STT-RAM); in highly ordered (e.g., $L1_0$) magnetic alloys in thin film form; and in perpendicular magneto-recording media and STT junctions, as well as relaxation mechanisms in magnetic materials for spintronic applications.

The book also includes chapters on nonlinear dynamic properties of 2D arrays of magnetic nano-dots, dynamics of magnetic nanoparticles and nanodevices, as well as nonlinear optics, and magnetoplasmonic studies in magnetic nanostructures with an eye to biosensing applications.

The last two chapters are more fundamental in nature and are related to understanding magnetic exchange in molecule-based

magnets, and spin-polarized scanning tunneling microscopy, a sophisticated technique that enables studying magnetic phenomena on surfaces with real-space imaging and spectroscopy techniques down to the atomic level.

Rosa Lukaszew
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