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Nanostructured Magnetic Materials and Their Applications



Springer

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Preface

Today the role of magnetism in human life is more important than ever. The growing need for even higher data-recording densities has driven the size of particles used in recording media down into the nanometer range while the rapidly increasing power of computers has made it feasible to perform simulations of the dynamic properties of realistic model systems of sizes comparable to experimental ones. The quality and the resolution of the devices have been increased in parallel with the developments in scientific research. It is thus possible to fabricate and study these materials at very small, almost atomic scales. On the other hand the physical properties of the materials at such a small scale are observed to change dramatically compared to those of their macroscopic counterparts. That is, the nanoscale materials exhibit new or crossover phenomena connected with quantum size effects.

There is now intensive interest in the magnetic properties of nanostructured materials. The scientific research has concentrated on the design, synthesis and characterization of nanostructured materials during the past years. A number of methods based on physical principles have been developed for manufacturing and characterizing nanostructured materials.

There is a great expectation in industry that the results of these exciting scientific researches can be exploited in a new generation of high-technology devices. Many of the unique properties of these materials have high potential for technical applications in diverse areas such as information technology, magnetosensors, electronics, data storage, magnetic heads of computer hard disks, single electron devices, microwave electronic devices, etc. In fact, for instance, the GMR materials have already found applications as sensors of low magnetic fields, computer hard disk heads, magnetoresistive RAM chips etc. Even new terminologies, for example magnetoelectronics, spintronics, spin valve etc. have recently been introduced to refer to aspects of the field involving magnetic phenomena. Thus this generic nanotechnology will inevitably have great impact on a wide range of industrial sectors and on the everyday lives of humans. In other words, one of the pillars of industry in the 21st century may involve the field of magnetic and electrical nanoscale materials.

The idea for this book was born at the International Workshop on Nanostructured Magnetic Materials and their Application (NMMA2001), held in Gebze, Istanbul (Turkey) from September 3-7, 2001. The contributions are concentrated

on magnetic properties of nanoscale magnetic materials, especially on fabrication, characterization and the physics behind the behavior of these structures.

We would like to thank all the authors for their contributions. We should also acknowledge the great efforts of the people, especially Prof. Ahmet Ayhan, Prof. Alinur Buyukaksoy, Dr. Bulat Rameev and others who made major contributions to the organization of the meeting and made this publication possible.

Gebze Institute of Technology, Turkey,
April 2002

Donglu Shi
Bekir Aktaş
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