The Chemistry of the Actinide and Transactinide Elements is among the more than 150 new books that are made available each year in electronic format in the Springer eBook Collection, which is accessible at http://springerlink.com. For additional information, or to find the local Springer Licensing Manager, log onto http://springer.com/ebooks or http://reference.springerlink.com for complete details or to sign up for a free 30-day trial.

According to the editors, "[We] hope that this new edition will make a substantive contribution to research in actinide and transactinide science, and that it will be an appropriate source of factual information on these elements for teachers, researchers, and students and for those who have the responsibility for utilizing the actinide elements to serve humankind and to control and mitigate their environmental hazards" (p. xvii).

The editors have successfully attained these goals, and I heartily recommend this latest edition of a classic text to the audience for which they have intended it, and to scientists and engineers unfamiliar with the field who want to learn how to deal in their research with these two fascinating families of elements at the frontier of the Periodic Table. This authoritative, comprehensive, balanced, and insightful compilation of the chemical properties of these elements should remain the definitive work on the subject for many years to come.

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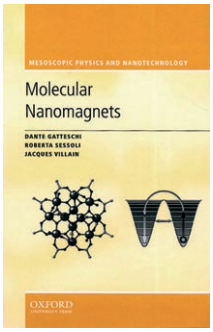
Molecular Nanomagnets



Mesoscopic Physics and Nanotechnology. By *Dante Gatteschi*, *Roberta Sessoli*, and *Jacques Villain*. Oxford University Press, Oxford 2006. 395 pp., hardcover £ 55.00.—ISBN 0-19-856753-7

Everyday life is full of useful magnets: solids, oxides, metals, and alloys. On the other hand, molecules are usually considered to be nonmagnetic. However, recent discoveries show that molecules can carry large magnetic moments, which can have a stable orientation similar to conventional magnets. These have therefore been called molecular nanomagnets or single-molecule magnets, and they might be the ultimate limit on the density of information storage. They exhibit not only the classical macro-scale property of magnets, but also new quantum properties such as quantum-tunneling of magnetization and quantum phase interference, the properties of a microscale entity. Such quantum phenomena are advantageous for some challenging potential applications, such as molecular information storage or quantum computing.

This book is the first attempt to cover in detail this new area of molecular nanomagnets, for which no other book is available. It addresses a readership of chemists and physicists. It is written for newcomers, and can be a reference book for scientists working in this research area. As the authors are two chemists and a theoretical physicist, the book is rich in molecules and equations. It covers the experimental and theoretical aspects of the chemistry and physics of the subject. The book can therefore be strongly recommended for everyone who is working in this or a related area, or intends to do so.

The book is divided into 15 chapters, which can be read independently. Only a few parts are a little dry and theoretical. The book contains about 450 literature references altogether, and most sections include abundant references to the original literature, with an emphasis on work published in the past 10 years, mainly between 1993 and 2003. It would have been helpful sometimes to list a few selected references for further reading.

The first chapter provides an introduction to the scope of molecular nanomagnets. Chapter 2 addresses the basic theories of magnetic interactions in molecular systems. It discusses mainly the spin-Hamiltonian approach and different exchange interactions. A certain amount of background knowledge is needed to appreciate it. Chapter 3 gives a very brief description of the main measurement techniques that are needed to characterize the magnetic properties of molecular nanomagnets, and explains what kinds of information can be obtained from the different techniques. A basic knowledge of experimental magnetism is assumed.

Chapter 4 summarizes the main synthetic strategies that have been used to obtain molecular nanomagnets. It should give the reader some basic tools to understand what is behind the chemical formula of molecular nanomagnets. The chapter also discusses the magnetic properties of the single-molecule magnets that have been investigated most thoroughly: Mn_{12}, Mn_4, and Fe_8. The spin-coupling schemes are shown, and the effective spin Hamiltonian for each species is discussed.

Chapter 5 deals with the thermally activated magnetic relaxation of molecular magnets. Transition probabilities and important equations are discussed. The basic features of spin–phonon interaction are described. To follow the discussions, readers will sometimes need to refer to the book by Abragam and Bleaney (1986).

Chapter 6 describes in detail the magnetic tunneling of an isolated spin. As well as discussing numerical diagonalization, the authors derive many analytical results. Even "diabolic points" are discussed.

Chapter 7 presents a short introduction to path integrals, which are useful to understand tunneling and quantum interference. Chapter 8 deals with tunneling in a time-dependent magnetic field, and Chapter 9 briefly describes the interaction of a spin with the external environment. The focus is on the hyperfine interaction and the dipolar interac-

tion between molecular spins. Tunneling between excited states, coherence, and de-coherence are discussed in Chapters 10 and 11. Chapter 12 looks briefly at disorder effects. Chapter 13 gives a short summary of special experiments on single-molecule magnets. Chapter 14 discusses other types of magnetic molecules, mainly wheels and grids. The last chapter describes emerging trends in molecular nanomagnetism, with particular attention to magnetic molecules on surfaces and single-chain magnets. The appendix is mainly devoted to mathematical tools.

The book succeeds in bridging the gap between the many different facets of chemistry on the one hand, and physics on the other hand. This book should be a useful addition to the chemistry and physics libraries of universities and research institutes. It provides a quick entry into the literature about suitable methods and examples of molecules that have been studied, and this subject is sure to gain in importance in the coming years.

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