Magnetism in amorphous materials

Magnetic Glasses

K. Moorjani and J. M. D. Coey
536 pp. Elsevier, New York, 1984. $127.00
Reviewed by Jeffrey W. Lynn

The field of structurally amorphous materials has witnessed an explosive growth in the last two decades due to the development of rapid quenching techniques (quenching rates of 10^6 K/sec and higher) that can make a wide range of metallic systems amorphous. These techniques allow one to fabricate materials with novel and exciting physical properties that not only challenge our fundamental concepts of condensed matter physics but also have important commercial applications.

The magnetic properties of amorphous systems are worth studying from two points of view. First, their intrinsic magnetic behavior is often of fundamental importance. Second, magnetic phenomena provide superb investigative tools—such as the introduction of magnetic impurities—for exploring the essential physics of these materials outside the realm of magnetism. Thus the magnetic properties permeate all aspects of amorphous systems.

Magnetic Glasses, written by two well-known researchers in the field, Kishin Moorjani and Michael Coey, is at present the most comprehensive and up-to-date reference book on this topic. The text provides a good discussion of the basic physical concepts essential for an understanding of these materials, and it could be used in its own right as an adequate introduction to the fundamentals of magnetism. However, the real usefulness of the work is contained in the well-written and thorough discussions of current concepts and research. In addition, each chapter includes an extensive list of references to the literature. An overall bibliography, as well as author, subject and chemical formula indexes complete the book.

There is a chapter on the magnetic properties of insulating glasses, a topic dating from ancient times. The principal area that the book addresses, however, is the magnetic properties of metallic glasses, such as the transition metal–metalloid systems (for example, Fe–B) and the rare earth–transition metal materials (for example, Tb–Fe), which have attracted great interest recently. Among these materials are numerous examples of ideal isotropic ferromagnets, spin glasses, random-anisotropy materials, and reentrant magnets, to name a few systems of current concern. The physics of these systems of course overlaps with that of crystalline systems, so the discussions are pertinent to the interests of a wide range of researchers. For those investigators directly interested in amorphous magnetism, *Magnetic Glasses* is an essential reference.

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Chemistry of Atmospheres: An Introduction to the Chemistry of the Atmospheres of Earth, the Planets, and Their Satellites

Richard Wayne
361 pp. Oxford U. P., New York, 1985.
$39.95 hardcover; $19.95 paper

There are two strong reasons for teaching university courses in atmospheric chemistry. First, the subject has now become a hard science: Principles have become clear, intellectual and practical questions abound, and the topics are amenable to theoretical and experimental investigations. Second, many students can be motivated to become good physicists and chemists by exposure to principles and applications of spectroscopy, reaction kinetics, photophysics and photochemistry in the context of the atmosphere of the Earth and other planets.

The noted photochemist Richard Wayne, from Oxford University, transmits the excitement and educational stimulation of atmospheric chemistry and physics in his new book *Chemistry of Atmospheres*. Indeed, he developed much of the book through teaching the subject to Oxford undergraduates. Those who are now teaching such courses know that atmospheric chemistry motivates students powerfully but that there are few books on which to base a course. Wayne's book is excellent, perhaps the best now available, at least for the study of gas phase atmospheric chemistry.

The scope of the topics covered in this book is broad and impressive. Wayne introduces and explains chemical and physical principles clearly and concisely, both in the introductory chapters and in the advanced topical discussions. He clarifies important concepts in thermodynamics, light scattering and the interaction of radiation with matter using examples well selected from atmospheric applications. For example, he makes clear the distinction between photodissociation and predissociation. The clarity and effectiveness of Wayne's exposition are all the more appreciable because he covers such a wide range of topics: the role of biological and microbiological processes in supplying gases to the atmosphere, photochemistry and chemical kinetics, the chemistry of ionized gases, the processes that give rise to ultraviolet and visible light emission from atmospheres, and the evolution and change of atmospheres on geological and human time scales.

Deficiencies of the book are the lack of material on condensed phase processes, such as the aqueous chemistry of clouds, and the absence of study problems and examples. As to the examples, one can compensate to some extent by consulting the fine references to books and research papers that Wayne provides. For help with condensed phase atmospheric chemistry, an increasingly important topic, one might consult John Seinfeld's *Atmospheric Chemistry and Physics of Air Pollution* (Wiley, New York, 1986) or the new book by Barbara Finlayson-Pitts and James Pitts, *Atmospheric Chemistry* (Wiley, New York, 1986).

Altogether, this book is a pronounced