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# BOOK REVIEWS

## Rock properties

Schon, J. H. 1996. *Physical Properties of Rocks: Fundamentals and Principles of Petrophysics*, Vol. 18 of: Handbook of Geophysical Exploration, Seismic Exploration, Series editors K. Helbig and S. Treitel, Pergamon Press, 583 pp. Price Dfl 267, $170.

A book such as this is quite difficult to review, as handbooks of rock properties are not the sort of reading I curl up with at the end of the day, like readers of this journal might with a book on finite strain analysis of microstructures. Thus, I waited to use this book as a resource, amongst others, while teaching a class in mechanical processes in rock deformation, in order to evaluate it. This book is part of a 24 volume series of handbooks for seismic exploration, and the intended audience appears to be practitioners of the art of seismic exploration. The book consists of ten chapters which present an overview of terminology, theoretical relationships, and compilation of data on porosity and permeability, density, magnetic, electrical, and thermal properties of rocks, radioactivity, 'elastic properties', which in this book are really seismic velocity properties, seismic attenuation behavior, and a summary chapter on the relationships between the various properties. As its title, and the series title suggest, the data presented are for workers in applied geophysics, rather than the more global or research-oriented handbooks recently published by the American Geophysical Union (Aherns, 1995).

Although the book's title suggests an overview of petrophysics, the most useful and highest quality portions concentrate on seismic properties of rock. Approximately one-third of the book is devoted to seismic properties. For a seismic illiterate such as myself, the compilation of data and the theoretical relationships which form the basis of these data is well presented and informative. Readers of this journal will be disappointed that elastic properties presented are not the moduli, compressibility, etc. that are determined in rock derformation experiments. However, good comparative figures and tables are presented to show the velocities of dry rock, cracked rock, rocks moistened to different degrees and with different fluids, and the properties of different fluids. Also covered nicely are the mechanisms and implications of shear-wave splitting phenomena, with overviews of the possible mechanisms (such as the work of Crampin and co-workers). A separate chapter on seismic attenuation properties, and its possible mechanisms, is well presented, although too much emphasis is placed on linear elastic models for the attenuation.

Having defined the strengths of the book in the realm of seismic properties, I must point out a number of weaknesses. Despite the encompassing title, the chapters on topics other than seismic velocities and attenuation are not as well done. My current interests in transport properties of rock led me to focus on the chapter on porosity and permeability, which I found to cover the topic shallowly, and without a complete set of references. Little of the work on the topic of Brace or Byerlee and coworkers is included, for example, and the data presented are almost all from sedimentary rocks. In addition, there appears to be no mention of capillary entry pressure or minipermeameter tests, which have been used in the oil and gas industry for some time. The omission of other rock types is contrary to the stated intention of the book outlined in the introductory chapter, which points out that a wide range of applications now rely on sound knowledge of physical parameters. The chapters on electrical, thermal, magnetic, and radioactive properties are sound, but are limited to a brief overview of the physics, followed by a variety of results of studies.

This latter point focuses on what I feel is the biggest weakness of this book. Little or no background on the techniques used to determine rock properties is presented. Thus, those workers who cut their teeth on Carmichael (1989) or the classic work in Clark (1966) will be disappointed by the absence of an organized, clearly written overview of how various measurements are made. In my class, the most useful discussions on rock properties based on Carmichael (1989) or Clark (1966) center on the clear introductions of each chapter, by experts in the field, of the basics of how measurements are made, the limitations of each technique, and a large list of references for the techniques and the results. The single-authored attempt in the present book results in weakness in the depth of some of the material, a lack of any background on how the values are obtained, and what the limitations and errors are in the different measurement techniques.

Other problems with the book are that despite the lip service paid to emerging issues in shallow, geotechnical applications, little data are presented on low pressure, low temperature properties of rock (c.f. Afrouz, 1992); little data are given for the volumetrically small, but in some cases, locally important rock types (salf, tuff, basalts).

The book provides a valuable European perspective, as shown by the reference lists, but this is unfortunately at the expense of North American, Australian, and Japanese work, which in some of the fields is extensive, and critical to fill in some of the topics ostensibly covered in the book.

A significant concern is the cost—listed as US $170 when the book was received. Given that this is the cost of but one of 24 intended volumes, the price is very high; especially given the better priced comparative books (Aherns, 1995; Carmichael, 1989).

*References*

Afrouz, A. A. (1992) Practical handbook of rock mass classification systems and modes of ground failure, CRC Press, Boca Raton, Florida, 195 p.

Aherns, T. (1995) editor, Handbooks of Constants, American Geophysical Union Reference shelf series, 3 volumes.

Carmichael, R. S. (1989) Practical handbook of physical properties of rocks and mineral, CRC Press, Boca Raton, Florida, 741 pp.

Clark, S. P., Jr. (1966) Handbook of physical constants, Geological Society of America Memoir 97, 587 pp.

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## Ocean margins

Banda, E., Torne, M. and Talwani, M., 1995. *Rifted Continent–Ocean Boundaries*. Kluwer. Price Dfl 260 US$185, £117.

This volume of 20 papers was published as part of the NATO ASI series and comprised the proceedings of a workshop held in Mallorca, Spain in 1994. The volume covers virtually all aspects of ocean–continent boundaries (OCB) including: volcanic margin processes; numerical models of rift propagation and melt generation; discussion of the sources of extensional stresses that might cause continental break-up; a set of papers on Atlantic margins, including transform margins; and papers on the Mediterranean and the Japanese Sea. This is a useful, well-written and well-edited series of review papers. Although biased towards the Atlantic margins, it is an important volume for all those interested in ocean–continent boundaries and the break-up process.

The first series of papers deal with OCB processes. A review of volcanic margins is presented by Eldholm *et al.*, which they define as those margins that possess clear seaward dipping reflectors. The OCB on such margins has extensive extrusive cover and a lower crustal high velocity body. Such margins are associated with an asthenosphere which has a high melt potential before, during and after break-up. Such margins are often, but not exclusively, associated with hot spots. Keen and Boutilier present an early stage review of finite element models to