

Book Review

Water in nominally anhydrous minerals, edited by H. Keppler and J. R. Smyth. Mineralogical Society of America and the Geochemical Society, 2006, 478 p., \$40, paperback (ISBN 093995074-X).

The Reviews in Mineralogy and Reviews in Mineralogy and Geochemistry series produced by the Mineralogical Society of America have consistently been useful sources of information on mineralogic and geochemical topics since their inception in 1974 (*Sulfide minerals*). These books are packed with information, well indexed and reviewed, and inexpensive even for those on student budgets. Volume 62 of Reviews in Mineralogy and Geochemistry, *Water in nominally anhydrous minerals*, is no exception. The topic of this book has been of great interest over the last decade to earth scientists who have realized that much of the terrestrial crustal and mantle water budget may be housed in silicate and oxide minerals that do not have OH sites such as amphiboles, micas, and other hydrous minerals. As the planetary science community becomes more interested in the role of water in planetary processes, knowledge of discoveries by the mineral physics community will be more and more useful. In fact, since Mars contains less water than the Earth, these nominally anhydrous minerals may be even more essential in understanding the water budget of Mars. This book is a great starting point for evaluating that and other questions relating to the role of water in a broad range of materials and processes.

The book starts off with a review (G. Rossman) of various methods for measuring water, including infrared (IR) spectroscopy, thermal gravimetric analysis, uranium reduction, manometry, coulometry, nuclear methods, nuclear magnetic resonance (NMR), and secondary ion mass spectrometry (SIMS). Two more focused chapters (E. Libowitzky and A. Beran; S. Kohn) deal with the polarized IR and NMR techniques with respect to principles, resonances, drawbacks, and problems, and give some examples of determinations of structural OH in pyroxenes, olivine, garnet, silica, feldspars, vesuvianite, beryl, cordierite, topaz, diopside, perovskite, and corundum. A chapter on atomistic models of OH defects (K. Wright) points out the importance of point and hydrogen defects in the ability of any given mineral to host hydrogen or OH.

After a comprehensive review of hydrous and anhydrous mineral structures at high pressures (J. Smyth), there are several chapters on the significance of anhydrous minerals for crustal (E. Johnson) and mantle (H. Skogby; E. Libowitzky

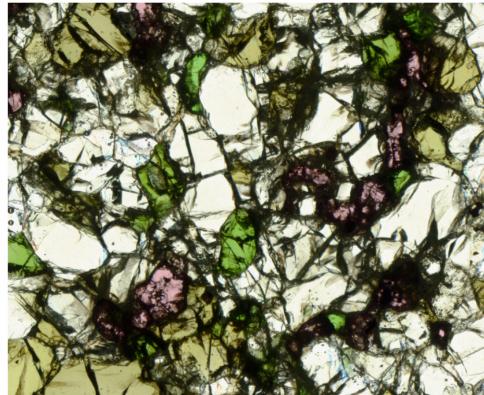


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WATER IN NOMINALLY ANHYDROUS MINERALS

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and A. Beran) minerals, as well as solubility and partitioning between various mantle minerals (H. Keppler and N. Bolfan-Casanova) and minerals and silicate melts (S. Kohn and K. Grant). Before more process-oriented topics are covered, there are several chapters giving some background about natural hydrous mantle phases such as amphiboles, micas, apatites, and magnesian silicates (D. Frost), and experimental studies of hydrous phases in the deep mantle related specifically to subduction zones (T. Kawamoto).

Diffusion of H in minerals is covered nicely (J. Ingrin and M. Blanchard), with an emphasis on experimental methods, analytical techniques, and a discussion of various anhydrous minerals. A group of papers treating the effect of water on equations of state for nominally anhydrous minerals (S. Jacobsen), seismic and electrical conductivity properties (S. Karato), rock deformation (D. Kohlstedt), deep mantle

phase transformations (E. Ohtani and K. Litasov), and geodynamics (K. Regenauer-Lieb) are joined by a broad discussion of water in the early Earth (B. Marty and R. Yokochi). The latter provides a thorough review of the origin of Earth's (and other bodies) water, and the implications for water throughout Earth's history. This topic has seen rapid change in the last decade, and is nicely captured in this chapter.

Anyone interested in the role of water in planetary interiors will find this book to be full of useful information. In

addition, chapters are written with ample introductory material and coverage such that the book will be of great utility to a student or an outsider.

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