

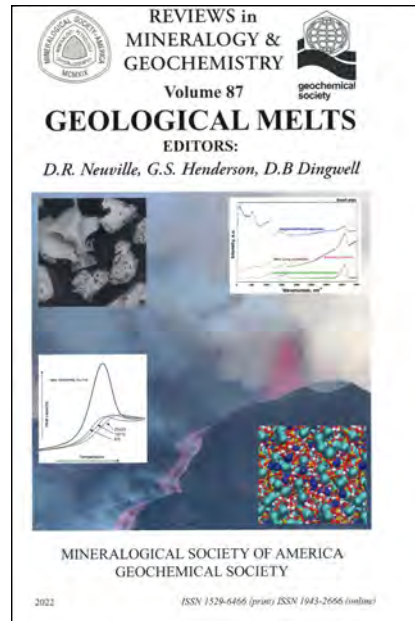
BOOK REVIEW

Book Review: Geological Melts, Reviews in Mineralogy and Geochemistry, Volume 87 (2022) Daniel R. Neuville, Grant S. Henderson and Donald B. Dingwell, editors. i–xix + 1088 pages. ISBN 978-1-946850-08-9

Twenty-seven years after the pioneering volume on silicate melts (Vol. 32, Stebbins et al. 1995), a new volume on magmas and melts of geological relevance has been published. While the old volume focused on structural, chemical, and physical properties of melts and glasses—the material *sensu-strictu*—this volume provides a significantly larger topical range that includes the specific role of melts or magmas in geologically relevant processes. In addition, a few aspects of this volume consider properties of glasses, including their technical and cultural relevance.

Several chapters deal with structural properties and make links to bulk properties of melts and glasses. The collection of articles highlights the complex interplay of short-, medium-, and long-range order that all control macroscopic properties such as density and viscosity or transport on the microscopic scale. A notable weakness of this volume is its need for a more complete collection of new literature emphasizing short-range order. Not missing is a chapter wrapping up recent developments on diffusion, particularly on the treatment of multi-component diffusion as well as current knowledge on crystal nucleation and growth. Compared to the 1995 volume, the computational power has substantially evolved, so that the reader is offered insights into the latest results from numerical simulation studies as well as the added value that may be gained by combining lab experiments with computationally derived structural models. In the last decade, substantial experimental and computational progress has been made regarding glasses/melts at extreme pressures, relevant to the lower mantle. Unfortunately, this is only reflected in a limited manner in the given chapter, but relevant links are given to literature on this topic. No book on magmas and melts would be complete without a treatment of chemical thermodynamics. This volume focuses specifically on the treatment of equilibria in multi-component melts and equilibria in gas-melt systems. They provide fundamental basics, highlight the complexity of developing comprehensive models, and illustrate the current possibilities and limitations. The formation of melts at depth is only treated in light of the role of volatile components and how melts contribute to mobilizing these components during planetary evolution. This certainly reflects the scientific activities of the past decades regarding the deep volatile-cycles of the Earth.

The largest part of the volume deals with aspects that are related to transport properties of melts and magmas, with a strong emphasis on magma rheology. The added value of this compilation of articles is that it emphasizes various fundamental natural processes (i.e., magma fragmentation, magma mixing, magma sintering, strain-localized flow or suspension rheology) and their relation to magma properties. These chapters address phenomena



that are ubiquitous in natural observations, but challenging to describe and analyze in a quantitative manner. The chapters provide a connection between the observation (e.g., natural evidence for magma mixing or strain localization on outcrop scale) and the responsible processes and their theoretical description. The observations are linked to various physical constraints and magma parameters and ways are indicated to quantify them.

In the case of magma-mixing, the authors illustrate how lab experiments and theoretical fluid-dynamic descriptions lead to numerical simulations that allow for assessing magma-mixing scenarios and how these results can be used to decipher textures found in natural rocks. Pyroclastic rocks represent large parts of deposits produced in explosive volcanism. The authors show ways how to understand the parameters controlling magma fragmentation and how this gives way to deriving the dynamics of volcanic systems throughout their geological lifetime. There are a couple of more exotic topics that found their home in this volume, such as frictional melting, non-magmatic glasses or non-terrestrial melts, that may only be of interest to a limited readership at first sight. However, the neighborhood to the more classical topics in the same volume may foster cross-fertilization between different communities.

Overall, this volume provides a huge range of topics largely related to geological melts and thus, provides a timely compendium on magma properties and their role in magmatic/volcanic processes. It may not fully replace the former volume, but rather extends it by linking the perspective on the material itself to the one on the geological processes observed in nature and geological archives.

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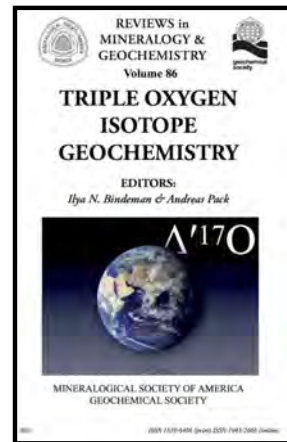
Reviews in Mineralogy and Reviews in Mineralogy and Geochemistry

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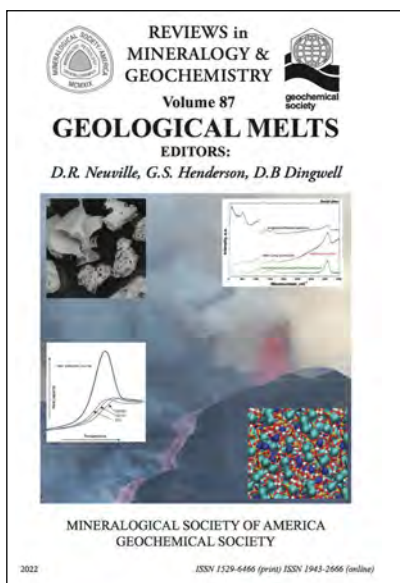
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Announcement: Two *New* *Reviews in Mineralogy & Geochemistry* Volumes

The Mineralogical Society of America is delighted to announce the availability of two exciting new volumes in the *Reviews in Mineralogy & Geochemistry* series.

Volume 87: *Geological Melts*

Daniel R. Neuville, Grant S. Henderson, and Donald B. Dingwell, editors



From the preface to the volume:

Collected in this volume are a compact set of chapters covering fundamental aspects of the nature of silicate melts and the implications for the systems in which they participate, both technological and natural. The contents of this volume may perhaps best be summarized as structure – properties – dynamics. The volume contains syntheses of short and medium range order, structure-property relationships, and computation-based simulations of melt structure. It continues with analyses of the properties (mechanical, diffusive, thermochemical, redox, nucleation, rheological) of melts. The dynamic behavior of melts in magmatic and volcanic systems, is then treated in the context of their behavior in magma mixing, strain localization, frictional melting, magmatic fragmentation, and hot sintering. Finally, the non-magmatic, extraterrestrial and prehistoric roles of melt and glass are presented in their respective contexts.

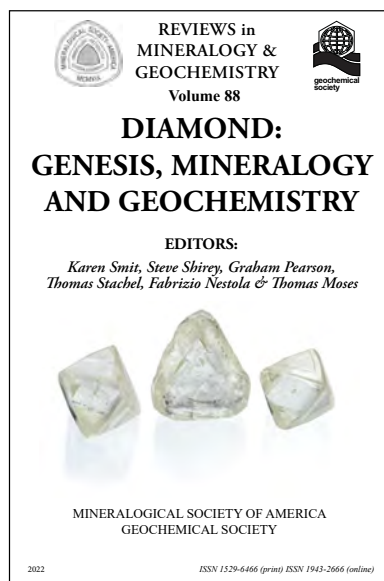
Volume 88: *Diamond: Genesis, Mineralogy and Geochemistry*

Karen Smit, Steven Shirey, Graham Pearson, Thomas Stachel, Fabrizio Nestola, and Thomas Moses, editors

This is an open access volume sponsored by the Gemological Institute of America, the Deep Carbon Observatory, and the Geological Survey of Canada.

From the preface to the volume:

*The purpose and goal of this new volume is to assemble all the chief current knowledge about natural diamond in one body for the use of the Earth Science community. The contents of this volume are wide-ranging, with the goal to leave little out so that any scientist could reach for this volume to obtain as much basic diamond knowledge as necessary. RiMG volumes have always served this role. An important feature of *Diamond: Genesis, Mineralogy and Geochemistry* is that the authors of several chapters used new and up-to-date databases that were expressly compiled for the purposes of accuracy in writing their chapters. These databases are available for community use at: <https://dataverse.scholarsportal.info/dataverse/diamond>.*



MSA wishes to extend its thanks to the volumes' editors, authors, and sponsors, as well as Ian Swainson, Series Editor, and Rachel Russell, Managing Editor of *American Mineralogist*. Both volumes are available to purchase in hard copy from the MSA Bookstore: <https://msa.minsocam.org/publications.html>. For any questions, please contact the MSA Business office at business@minsocam.org.