



Book Review

Using Geochemical Data to Understand Geological Processes

Rollinson H. and Pease V. Cambridge University Press. pp346. Paperback price £49.99. ISBN 978-1-108-74584-0 <https://doi.org/10.1017/9781108777834>

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If you ever feel like questioning the need for an on-the-shelf reference book at a time when e-resources are increasing exponentially then I suggest you pick up a copy of the latest version of *Using Geochemical Data* published by Cambridge University Press in 2021 and have a flick (or scroll) through its pages to immerse yourself in the multitude of ways that geochemical data – the baseline currency of all Earth Science disciplines – can be assessed, applied and interpreted. Whether it's the all-encompassing breadth of concepts covered, or the welcoming familiarity of the thematic chapters that enable you quickly address the question at hand (regardless of whether or not that question prompted your original search...), this exceptionally updated second edition by Rollinson and Pease is sure to be as invaluable a resource for graduates, postgraduates and professionals as its predecessor was.

Like the original book, this revised version does not shy away from its bias on petrological applications. The title has been slightly tweaked to better reflect its emphasis on understanding geological processes, and the majority of examples retain a 'hard-rock' context that is reflective of the authors' background and interests. However this focus does not detract from the primary intended use of the book, which is to guide the reader in how to understand, use and apply their geochemical data in a manner that is consistent with the latest developments in the field. In this context the definition of core statistical approaches and limitations presented in Chapter 2 makes essential reading for any burgeoning geochemist, while the thematically worked examples and excellent colour figures ensure these concepts remain relevant to the reader throughout the text.

The central components of the book (Chapters 3–5) focus on the use of major- and trace-element data, and how they can be combined to identify and differentiate between tectonic environments. In all cases these chapters are structured mainly around the plots and diagrams that can be used to handle geochemical data, with the clear headings, illustrated examples and up-to-date referencing offering an excellent accompaniment to both introductory-level courses and more established practitioners looking for ideas of alternative ways in which to present their results. The text nicely complements these case studies, providing context to the development of the classification approach where relevant, and emphasising the limitations of each technique and/or where care must be taken in their use. Chapter 4 also covers the key theoretical concepts and laws that govern element distribution, with the updated section on partition coefficients

providing a particularly excellent introduction to this important geochemical concept. In demonstrating how major- and trace-element data can be used to distinguish between different tectonic environments, Chapter 5 represents the most applied section of the book, which is likely to be of limited appeal to a non-specialised audience. Nevertheless, this chapter remains true to the overarching concept of demonstrating how discrimination diagrams can be used and the circumstances under which they are (and aren't) effective, rather than simply promoting their use as a petrological classification tool.

The final two chapters of the book cover the use of radiogenic (Chapter 6) and stable (Chapter 7) isotope systems, with both sections focusing on the principles behind some of their geological applications, rather than different ways of presenting isotopic data. As a result, these chapters offer a solid introduction to topics such as the use of isochrons in geochronology and source differentiation in petrology (Chapter 6), or thermometry and water-rock interaction (Chapter 7), with the updated figures and tables providing a useful summary of our current understanding of the extent of isotopic variation observed in natural systems. Chapter 7 is also the most expanded part of the book, with the inclusion of a new section on non-traditional stable isotopes (specifically Li, Mg, Si, Cr and Fe) reflecting the considerable advances in analytical technologies that have occurred since the publication of the first edition nearly 30 years ago (many of which are succinctly summarised in Chapter 1). Like the preceding section on traditional stable isotopes, the emphasis of the new text remains strongly on the application of these systems in a high-temperature/petrological context, though segments on the mechanisms that control the extent of fractionation in each system and their potential to be used as tracers of other biological/geological/cosmological processes do a good job of highlighting some of the other ways in which these isotope systems are currently being applied.

It is easy to assume that a book like this that crams so many different fields and concepts in between its covers might fail to hit the mark, such that it simply skims the surface of the underlying theory and applications without providing the level of detail that can be found in more focussed discipline-specific reviews. However in my mind the unquestionable success of this book is down to the very fact that it does not attempt to delve too far into those specifics – interested readers are given plenty of guidance on where to start their journey into which ever rabbit hole or application takes their fancy, and this book simply seeks to ensure that they are equipped with the necessary tools and knowledge in

how to proceed along that journey. This second edition has skillfully updated the waymarkers from the original version where needed, and provides new signposts that reflect the current and potential future directions of the geochemical community, but ultimately its true value lies in the succinct collation and presentation of the fundamental approaches for handling and evaluating

geochemical information that won't change over time, even though the data being used or intended application may do. This is what a reference book is for, and why I am sure that *Using Geochemical Data* will justifiably continue to adorn the bookshelves of many aspiring, professional and interested geochemists for decades to come.