RiMG 82: *Non–Traditional Stable Isotopes*

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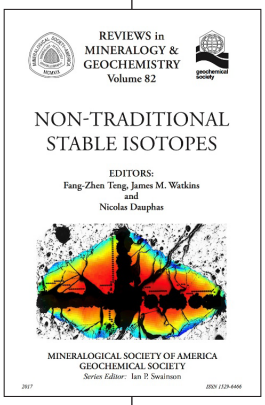

Thirteen years ago, in 2004, the book *Geochemistry of Non-Traditional Isotopes* [Volume 55 of the Reviews in Mineralogy and Geochemistry (RiMG) series] was published. Since then, tremendous advances in multi-collector inductively coupled plasma (ICP) mass spectrometry has made the precise measurement of additional isotope systems possible. This, together with advances in the calculation of equilibrium isotope fractionation using ab initio methods, has led to an unbelievable increase of publications, making it hard for the interested reader to keep up. Therefore, the publication of *Non-Traditional Stable Isotopes* (RiMG 82) is highly welcome.

The term "non-traditional stable isotopes" is not well defined, but, according to the editors of RiMG 82 (Fang Zhen Teng, James M. Watkins, and Nicolas Dauphas) a distinction can be made in terms of how isotopes are analysed. Light isotope systems (C, H, O, N, S) are measured by gas-source mass spectrometers, whereas non-traditional isotope systems are measured predominantly by multi-collector ICP mass spectrometers.

RiMG 82 consists of 20 chapters, assembled by a group of nearly 50 authors. The editors are to be congratulated in attracting the top experts as contributors. The first five chapters deal with general themes and concepts of isotope geochemistry, such as theoretically and experimentally determined equilibrium fractionation, kinetic fractionation by diffusion and crystal growth reactions, and in-situ analysis exemplified by Mg isotopes. The following 14 chapters represent the core of the book: they discuss 15 elements and their natural variations in isotope composition (Zn and Cu isotopes are discussed in one chapter). Each chapter is subdivided in a comparable way with similar subheadings. After a description of the analytical techniques, there are discussions on the applications to cosmochemistry, high- and low-temperature geochemistry, and geobiology. Finally, future developments are considered. Especially valuable is a detailed up-to-date reference list, with at least 100 entries for each chapter, sometimes up to 500 (for Fe).

The majority of elements discussed in RiMG 82 also appeared in RiMG 55, except for B and Ca which unfortunately are missing from RiMG 82. A comparison of the elements discussed in both volumes – Li, Mg, Si, Cl, Cr, Fe, Zn, Cu, Se, Mo – demonstrates the increase in knowledge since 2004. Not only have the length of articles and the number of citations nearly doubled, but the number of applications that go beyond geosciences has also increased considerably. Conclusions from the newly discussed elements of Ni, Ge, Hg, Tl and U rely sometimes on a limited database, but future studies in the next few years will strengthen some of the inferences. Additional elements, such as K, Ti, V, Sr, Cd and Ba, are already known to have established natural isotope variations and should be included in the *next* edition, which hopefully will appear in less than 13 years. Thus, scientists working on non-traditional isotopes have a bright future ahead of them.

The final chapter by Francis Albarède and coworkers about medical applications of metal and sulfur isotopes presents strong evidence that cancer tissues differ from healthy tissues in their isotope compositions. These authors state that metal isotopes have opened up new perspectives on biochemical mechanisms associated with cancer. This chapter is one of the highlights of the book.

RiMG 82 is a high-quality state-of-the-art review, being of equal interest to students and professionals. Although the individual chapters are generally written in a comprehensive style, a few could have been condensed (those on Ge and Tl) without losing much information. As a whole, RiMG 82 convincingly shows the great potential of non-traditional stable isotopes in solving basic scientific questions in natural science. This book is a must for everybody interested in isotope geochemistry.

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1 Teng F-Z, Watkins JM, Dauphas N (eds) (2017) Non-Traditional Stable Isotopes. Reviews in Mineralogy & Geochemistry, Volume 82. Mineralogical Society of America, 885 pp. ISBN 978-0-939950-98-0, US$ 50