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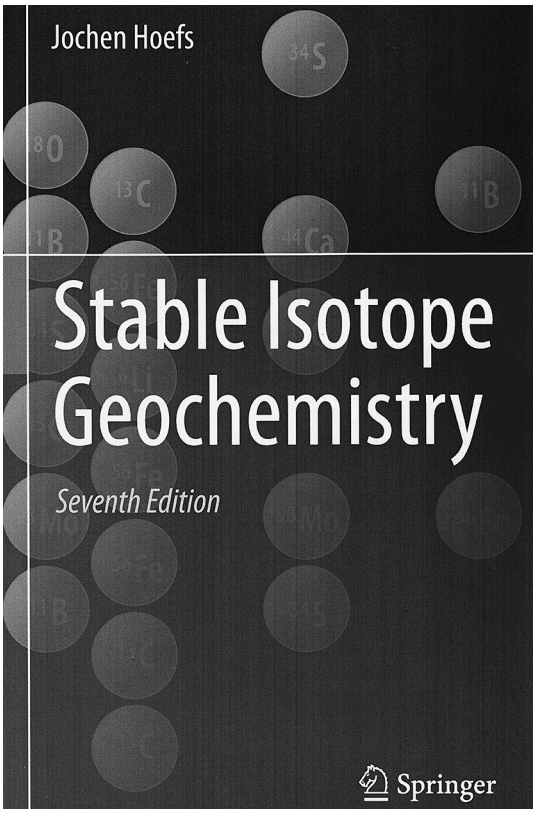
Book reviews

Stable isotope geochemistry, by J. Hoefs, 2015. Springer, Heidelberg/Berlin. 389 pages. Hardcover: price USD 99.00. ISBN 978-3-319-19715-9.



During the second half of the twentieth century and the first two decades of the current century interest in stable isotope studies and their application in the geosciences has increased overwhelmingly. This has been a reaction to the growing importance of isotope studies in resolving diverse geological problems. Over the years, alongside well-known and established applications new ideas for the use of isotopes have been put forward as a result of progress made in our knowledge of stable isotope geochemistry but also development of new, more precise analytical procedures. The increased sensitivity of analytical equipment has led to more precise measurements but, most importantly, it has broadened the range of materials that can be analysed.

'Stable isotope geochemistry' by Jochen Hoefs, a renowned and well-respected geologist with over 150 scientific papers published in international journals, serves as a compendium of current knowledge of stable isotopes and their application in the geosciences. Since its first publication in 1973 the book has been rewritten or updated several times to keep track of the most recent advances in stable isotope geochemistry. Publication of the 7th edition of the book is proof of the progress that has been made in isotope studies and the keen interest in their application in the earth sciences.

The book is divided into three chapters describing (1) theoretical and experimental principles of isotopes and isotope studies, (2) isotope fractionation processes of selected elements and (3) variations of stable isotope ratios in nature.

In the first (and shortest) chapter the author summarises the principles of isotope studies, supplying theoretical information on isotopes, isotope effects and fractionation processes. The basics of analytical techniques, principles of mass spectromerty and standards used are also outlined.

In the second chapter isotope fractionation processes of selected elements are described. The author concentrates on isotopes of 30 elements including carbon, oxygen, sulphur, calcium, iron, copper, strontium and uranium, commonly applied in studies of different natural archives. The characterisation of each of these elements includes data on average abundances of its isotopes, the naturally occurring variations in their isotope composition, analytical methods and standards used in isotope measurements and, finally, fractionation processes and isotope variations of each element and distribution in geologically important reservoirs.

The most extensive, third chapter of the book focuses on variations of stable isotope ratios in nature. The author distinguishes 12 natural environments and geological areas of isotope study application: extraterrestrial materials, the earth's upper mantle, volatiles in magmatic systems, ore deposits and hydrothermal systems, hydrosphere, isotopic composition of dissolved and particulate compounds in ocean and fresh waters, isotopic composition of the ocean during geological history, atmosphere, biosphere, sedimentary rocks, palaeoclimatology and

metamorphic rocks. Due to such a vast range of natural environments and their geochemical characteristics, different isotopes and adequate fractionation processes are discussed for each of the reservoirs. The part that describes the application of stable isotopes in studies of the hydrosphere includes a discussion of hydrogen (δD) and oxygen ($\delta^{18}O$) isotope composition and fractionation processes in various reservoirs including meteoric water, ice cores, groundwater, ocean water, pore water, formation water and water in hydrated salt minerals. Much more diversified are isotope studies of the biosphere, where ratios of C, H, O, N and S stable isotopes are commonly measured and used as proxies in studying living and fossil organic matter, in determining the source of organic matter or in exploring oil, coal and gas reservoirs.

Each chapter of the book ends with an extensive list of references that reflect the variability of isotope applications in the geosciences, including potential possibilities but also limitations and problems to be considered. References cited do include pioneer isotope studies but the majority of papers listed postdate the year 2000, with the most recent publications considered as well.

The present tome is an excellent introduction to stable isotope studies in the geosciences and may be regarded as a good starting point for anyone ready to embark on a stable isotope adventure. Readers who are looking for detailed characterisation of specific isotopes and their application in geological studies may be disappointed by the paucity of detailed data provided. However, such simplification is inescapable in view of the wide array isotopic applications and the high degree of specificity of isotopic studies within any specific geological reservoir.

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