
Preface

Studies in stable isotope geochemistry have been since its beginning a strong and vital branch of earth sciences, but in the past decade, growth has occurred at an ever-increasing pace as a consequence of major advances in mass spectrometry, in micro-analytical techniques, and in calculating equilibrium isotope fractionations using *ab initio* methods. In specific, the application of multicollector-ICP-mass spectrometry now enables investigations of stable isotope compositions with adequate precisions for a wide range of transition and heavy elements that could not be measured before. Precise ion-microprobe measurements on the micrometer scale allow the detection of isotope heterogeneities in individual minerals. Analysis of multiple rare isotopes of elements permit the detection and distinction of mass-dependent and mass-independent processes. These major advances in analytical tools make substantial major revisions and extensions of the last edition necessary.

The structure of the book has been retained. New topics are presented that range from the isotope composition of plants to the isotope composition of the earth's core. The first part gives a general introduction to the theoretical and experimental principles. In the second part, natural isotope variations and fractionation processes of 30 elements are discussed. By adding 25 “non-traditional” elements, including Sr and U, this part has been substantially enlarged, although the backbone of this chapter is still the classic elements H, C, O, N and S. Conclusions from the newly added elements rely sometimes on a very limited data base; future studies have to strengthen some of the inferences.

As in earlier editions, the third part discusses natural variations of isotope compositions in the context of the classic geochemical “spheres”. New findings from non-traditional isotope systems have been incorporated. A very long list of references with many new citations enables a quick access to the exponentially growing recent literature. Nevertheless, I have neglected a number of recent references, because the citation list encompasses already about 30 % of the book.

Again, I have tried to provide a contemporary overview of the entire field of stable isotope geochemistry. I hope I am presenting a well-balanced discussion, although I am fully aware of omissions and shortcomings.

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