
Preface

First studies on variations in Ca stable isotope compositions were carried out early on (Backus et al. 1964; Hirt and Epstein 1964; Artemov et al. 1966; Miller et al. 1966; Mesheryakov and Stolbov 1967). However, reliable results were not obtained before Russel et al. (1978) published their seminal paper entitled “Ca isotope fractionation on the Earth and other solar system materials”. This work facilitates the reliable and accurate determination of Ca stable isotope compositions using double spike—thermal ionisation mass spectrometry. Albeit further improvements were made, their method is still the method of choice for most Ca stable isotope analysis. Only few studies focused on Ca stable isotopes until the late 1990s, since then the number of studies dealing with Ca stable isotope fractionation is steadily increasing. This reflects both analytical advances and promising results obtained in a large variety of applications in Earth and Life sciences, including medicine.

The aim of this book is to provide an overview of fundamentals and reference values for Ca stable isotope research (“[Introduction](#)”), current analytical methodologies including detailed protocols for sample preparation and isotope analysis (“[Analytical Methods](#)”) and different fields of applications including low-temperature mineral precipitation and biomineralisation (“[Calcium Isotope Fractionation During Mineral Precipitation from Aqueous Solution](#)” and “[Biominerals and Biomaterial](#)”), Earth surface processes and global Ca cycling (“[Earth-surface Ca Isotopic Fractionations](#)” and “[Global Ca Cycles: Coupling of Continental and Oceanic Processes](#)”), high-temperature processes and cosmochemistry (“[High Temperature Geochemistry and Cosmochemistry](#)”) and finally human studies and biomedical applications (“[Biomedical Application of Ca Stable Isotopes](#)”). These major areas of research are introduced and their current state of the art is discussed and open questions and possible future directions are identified.

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Gussone, N.; Schmitt, A.-D.; Heuser, A.; Wombacher, F.;

Dietzel, M.; Tipper, E.; Schiller, M.

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