

make reading easier. In one case the figure is to be found six pages on.

Part I of the book is a valuable textbook on crystal chemistry; Part II is more likely to prove of interest to lecturers seeking different approaches to basic concepts.

C. H. MCKIE

Clauer, N. and Chaudhuri, S. *Clays in Crustal Environments: Isotope Dating and Tracing* Berlin, Heidelberg and New York (Springer-Verlag), 1995. xii + 359 pp.. Price DM. 148.00. ISBN 3 540 58151 0

In this book the low-temperature isotope geochemistry of clay minerals in various environments of the uppermost crust of the Earth is considered. Weathering profiles, transport and deposition, and the diagenetic and metamorphic fate of a rock are discussed. The main focus of the book is on dating and tracing clay minerals, because these are questions relevant to everybody investigating them — whether that is for their use as stratigraphic or tectonic markers, or as climatic, fluid, or physico-chemical tracers.

The six chapters are structured like individual articles. Chapter 1 (Introduction) gives a very brief overview of the structure and classification of clay minerals, and of the principles and methods of isotope geochemistry. Furthermore, and very importantly, problems with methods themselves (e.g. Ar-diffusion), and the effects of various treatments necessary for separation and preparation of the clays for isotopic analyses are highlighted.

Chapter 2 (Continental Weathering) deals with (mainly Sr-) isotopic changes and physicochemical conditions of both silicate minerals and ambient fluids during weathering processes. These conditions have a considerable effect (isotopic inheritance) on the pedogenic clays; a model is presented for the derivation of those. The importance and the effects of the presence of micro-environments in soils is clearly shown.

Chapter 3 (Young Continental and Oceanic Sediments) discusses the changes in Sr-, Nd-, Ar- and stable isotopic signatures of suspended and dissolved loads of rivers from the drainage basin to their deposition, alteration, and burial in the ocean. The problem of differentiating between detrital terrigenous and authigenic oceanic minerals such as glauconites, palagonites, smectites, and celadonites, and of the mode of their formation, is emphasized.

Chapter 4 (Sedimentary Rocks) includes two aspects. Firstly, the difficulties (e.g. detrital isotopic memory) of dating timing and duration of deposition by Rb–Sr, and K–Ar methods are discussed. The second part is on the timing and the physicochemical

conditions of both formation and evolution of diagenetic clay minerals in shales and sandstones. It revolves about illitization of smectites and its most influencing factors. The timing, and the thermal and physicochemical evolution of clay authigenesis in hydrocarbon reservoirs is considered, and also the role of pore-fluids and water-rock interactions with respect to the O- and H-isotopic composition of diagenetic clays. The disputes of mass-transfer and open/closed-system behaviour in sedimentary basins are discussed.

In Chapter 5 (Mica-type Minerals in Low-temperature Metamorphic Rocks), the authors point out that the onset of various types of metamorphism causes more coherent isotopic relationships between the various rock-components than those found in sediments. Although permeability and size-fractions of the clay particles affect the degree of isotopic memories, and isotopic records of recrystallized minerals depend on the original chemistry, they may be useful in describing dynamics of tectonism and the timing of (hydro-) thermal events.

Chapter 6 is entitled 'Frontiers in Clay Isotope Geochemistry', and is basically a review of the previous chapters. It shows what the current state of isotope geochemistry of clay minerals is, what is known and what is still unclear, what needs to be better established, and what needs to be done in order to achieve these better insights into stable isotope geochemistry.

As this book is not supposed to be a textbook, it does not contain much background or basic information. However, the inclusion of some more references, in particular in the Introduction, would have improved its value for less advanced isotope geochemists. A more detailed and subdivided index would have made it more useful as a reference book. What made it difficult to read on occasions are the abundant, strongly condensed excerpts from refereed papers. Often, their results could have better been displayed in a table rather than being listed in the text (e.g. p. 268). The figure captions often lack sufficient description and explanation of the symbols, lines, or numbers in order to be able to easily and quickly understand the diagram (e.g. Figs. 1.3, 2.1, 5.17). Spelling mistakes are rare (*Lenan* — *Leman*, *gauconites* — *glauconites*), and the identity of referred authors might not always be their real one (*Longstaffe FK* — *Longstaffe FJ*).

The book gives a very good overview of the studies published to date on the subjects of discussion. Discrepancies between the studies are pointed out, substantiating the importance of careful and appropriate sample separation and preparation, confirming the ambiguity of interpreting low-temperature isotope data, and corroborating the need for a better understanding of the controlling

factors. Although the care required to recognize the existence and effects of precursors and isotopic memories has been highlighted, the question of whether stable isotopes really tell us what we think they do has not been clearly posed. In the preface, the authors rightly point out that it is almost impossible to cover the current diversity of clay mineral isotope geochemistry in one book. Their aims were to familiarize the readers with various isotopic approaches, the dynamics of the evolution of clay minerals, to demonstrate the current state of the art in isotope geochemistry, and also to stimulate further progress in the research of isotopes in clay minerals. These aims are certainly accomplished. Some concluding final remarks on as yet unsolved fundamental problems of isotope geochemistry, and on the future outlook of new, expanded, or refined applications would have been a nice rounding off.

K. ZIEGLER

Mahadevan, T. M. *Deep Continental Structure of India: A Review*, Geological Society of India, Memoir 28, 1994. 569pp. Price US\$ 60.

Many clues to the overall understanding of continental areas are locked up in the lower crustal layers, which, with the ever increasing sophistication of geophysical techniques and instrumentation these layers, are now becoming accessible. This twelve chapter Memoir summarises the geophysical evidence for the nature of the deep crust under India. It appears an impressive summary of a vast amount of data and of conflicting ideas and, to many outside India, will be a welcome reference book.

In outline, the first three chapters serve as an introduction and define the geographical limits of the Indian continental crust, and also examine different terminology in the context of modern concepts of crustal structure. Basic criteria are introduced for describing deep crustal structure and the position of various discontinuities. Techniques of data acquisition have changed radically and the increasing use of satellite data in relation to ground acquisition is discussed. There are sections on magnetic, gravity, resistivity and seismic data acquisition, including deep seismic sounding techniques, and heat flow measurements. The data are put into context with respect to the exposed sections through the crust as India has large areas of high-grade metamorphic rocks, effectively middle to lower crust, exposed for examination. One section discusses the capabilities of instrumentation, some of it designed and built in India. Chapter three concludes the introduction and describes the geological framework of the geophysical defined regions and there are several summary maps of the different types of data which

can be used to find sources for details of smaller areas. Various models for the structure of the crust are discussed and comparisons with other shields made.

The details are presented in the next seven chapters. Chapter four describes the detailed data obtained from Peninsular India and covers both the Archaean cratons and Proterozoic mobile belts. A detailed review of the geology is followed by the geophysical data discussed in detail for smaller areas within the main regional framework. The chapter ends with inferences and summary. Once the Precambrian crystalline basement is described, Chapters five and six deal with the Proterozoic platformal sedimentation and the Gondwana cratonic sedimentary basins. There are sections on each occurrence and again it is easy to seek out the source references and available data. The Mesozoic–Tertiary volcanic provinces are described in Chapter seven. The younger sedimentary basins in Chapter eight and the Himalaya in Chapter nine. The continental margins of India are described in a separate chapter, ten. The final two chapters, eleven and twelve, deal with the interpretation of the data and a summary of the different scenarios that the data allow. Finally, the concluding two chapters give a framework for future research and discuss where this might lead.

This volume is reasonably produced, but some of the diagrams have lost their clarity because of reduction, which could have been avoided. The Memoir is specifically designed as a review text and provides a summary of an integrated case study by many different methods of a complete continental area. It may thus have a value in teaching, though I would expect it to be found in a University Library catering for research and applied studies. Probably only specialists would have a personal copy. As a non-specialist, I found it relatively easy to follow and gives a good introduction to those wanting to know more about the deep structure of the crust.

C.R.L. FRIEND

Golley, P. and Williams, R. *Cornish Mineral Reference Manual*. Truro (Endsleigh Book Co., 50 Daniell Rd., Truro, TR1 2DA), 1995. viii + 71 pp. Price £9.20 (+ 80p postage). ISBN 0 951 9419 92.

This work represents an up-to-date list of the minerals known to be found in Cornwall, together with their chemical formulae and literature reference for the first documented occurrence of each species in the county. Entries are listed in bold type where their occurrence in Cornwall is beyond doubt; entries not in bold type are either of questionable occurrence or require further study. A total of 424 species are