



Journal of Sedimentary Research

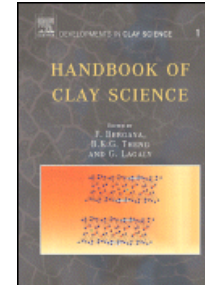
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Handbook of Clay Science, edited by F. Bergaya, B.K.G. Theng & G. Lagaly, 2006. *Developments in Clay Science*, vol. 1. Elsevier, The Boulevard, Langford Lane, Kidlington, Oxford OX5 1GB, United Kingdom. Hardbound, 1245 pages. Price GBP 105.00; USD 165.00. ISBN 978-0-08-044183-2.



A book titled “*Handbook of Clay Science*” promises a comprehensive and structured synopsis of clay-mineral knowledge. I was eager to learn how far this stretches into the earth sciences, and particularly into sedimentary geology. From a casual perspective, chapter titles like “Structures and Mineralogy of Clay Minerals,” “Mechanical Properties of Clays and Clay Minerals,” “Thermally Modified Clay Minerals,” “Clay Mineral Organic Interactions,” “Clay Minerals and the Origin of Life,” “Clays, Microorganisms, and Biomineralisation,” “Identification and Quantitative Analysis of Clay Minerals,” and “Genesis of Clay Minerals” suggest that this book indeed contains valuable information for earth scientists. My thorough reading of the 1245 pages confirms this, but most scientists without a higher degree in (geo)chemistry or mineralogy will find the text difficult to understand. In spite of what the authors state in the blurb, the *Handbook of Clay Science* is not suitable as a first entry for newcomers and graduate students, at least not for those studying geology or geophysics, because a profound knowledge of chemical principles, analytical methods and nomenclature is required from the start. Information on physical processes of clay transport is scarce, so sedimentary geologists interested in the rheology of clay-rich sediment (including cohesive properties, yield strength, viscosity, bed shear strength, flocculation behavior) should look elsewhere.

The first chapter identifies the main types of clay minerals and their fundamental physical and chemical properties. The following two chapters describe in detail the mineralogy, surface chemistry, layer structure and interface chemistry of dioctahedral 1:1 layer clay minerals (the kaolin group: kaolinite, dickite, nacrite and halloysite), trioctahedral 1:1 layer clay minerals (the serpentine group), 2:1 layer clay minerals (e.g., pyrophyllite, talc, mica, illite, smectite, vermiculite and chlorite), allophane, imogolite, palygorskite and sepiolite. Chapter 5, which discusses the colloidal properties of clay minerals, is the next chapter with some geological merit. Coagulation, flocculation and gelation mechanisms are described, but mainly from an applied industrial perspective. Chapter 6 contains a disappointingly short section on the swelling properties and rheological behavior of clays.

Clay minerals are highly chemically reactive. The modification of clay minerals under the influence of acids, temperature, and organic species is the subject of Chapter 7. Particularly interesting is a short discussion on the role of clay minerals as catalyst in the origin and evolution of life on Earth. Chapter 9 provides useful information on the conversion of ions in aqueous solution into solid clay minerals by living organisms (biomineralization). After two long chapters on the use of clays in industry, environmental management and health (Chapters 10 and 11), a detailed summary of spectroscopic techniques for clay-mineral characterization is given (Chapter 12). Unfortunately, the information in this chapter is too fragmented and without enough detail to appeal to a broad readership. The text would also benefit from a smaller number of examples of analytical results, and more transparent descriptions of basic technical principles. Amongst other

clay-related materials, zeolites are compared with clay minerals in Chapter 13. The chapter titled “Genesis of Clay Minerals” (Chapter 14) discusses the geological significance of clay minerals in weathering, sediment transport and deposition, diagenesis, low-grade metamorphism and hydrothermal alteration, but this information adds little to existing text books on clay minerals aimed at the geological community.

The whole appearance of the book, including its robustness and the print quality of text and figures, is excellent, but this comes at a high price. The editors have done a commendable job in keeping grammatical errors and typos to a minimum. Most of the content is written in a style that is rather dry and uses a minimum number of figures, so the consumption of large quantities of text at a time is not recommended.

In summary, most sedimentary geologists will find little benefit in reading this book. Merely a select group of geochemists and mineralogists may find the *Handbook of Clay Science* a valuable source of information. This does not at all mean that this is a mediocre book; it is just aimed at a more specialized audience than the title leads to suggest.

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