Clays and Clay Minerals, Vol. 61, No. 5, 475–476, 2013.

BOOK REVIEW

Deer, Howie, and Zussman. Rock-Forming Minerals, Sheet Silicates: Clay Minerals. volume 3C, Second Edition, 2013. M. J. Wilson. The Geological Society, London, 724 pp. ISBN: 978-1-86239-359-2, Price: £120.00.

The latest volume of Deer, Howie, and Zussman, *Rock-Forming Minerals series – Sheet Silicates: Clay Minerals*, deviates from the original concept of including clay minerals as part of volume 3B that was to be titled *Layered Silicates Exclusive of Micas*. Instead, the volume under review, volume 3C (second edition, 2013) became a separate entity when it became clear that there is abundant research to support a separate volume, and volume 3B became *Layered Silicates Exclusive of Micas and Clay Minerals*.

The organization of volume 3C generally presents a separate chapter for each of the minerals of a clay-minerals group, with the number of minerals greatly increased from the earlier (1962) edition. The volume is divided into eight major sections, with six sections on clay-mineral groups related to: kaolin, mica, smectite, vermiculite, and mixed-layer structures (regularly interstratified and randomly interstratified structures). Each of these six sections is divided into chapters of mineral species pertaining to each group with descriptions covering structure, chemistry, optical, and physical properties, and distinguishing features and paragenesis. Additional descriptions include the important characterizing features of clay properties, such as ion exchange, adsorption, some organic complexes, swelling, thermal analysis, dissolution, and many other colloid properties. The seventh section involves "interlayering", defined by the author as involving a smectite or vermiculite layer interstratified with a non-exchangeable, dominantly hydroxy-aluminum complex; this section is not subdivided by mineral species, but by the descriptions as given above. The eighth section is on palygorskite and sepiolite clay minerals, with a chapter on each of the two species. Some clay minerals (*e.g.* serpentine, chlorite) that are included in volume 3B are reasonably excluded from this volume, and mixed-layer serpentine and mixed-layer chlorite interstratified phases are justly included here. As with other volumes of the series, references are given at the end of each chapter (or section, if not subdivided) and there is an index.

The interlayered clay minerals are probably an unknown mineral group to most geologists, although these phases are common in acidic soils, and it is likely that these phases do not survive after burial or after transportation to sediments having other pH ranges. An advantage of including minerals found in soils in addition to minerals only found in rocks, as the title of the series implies, is that the reader is exposed to the greater variety of clays and clay mineral structures. This sixteen-page section, the smallest of all the sections, and the brevity and tentativeness of the wording of the structure descriptions, attests to the apparent need for more research in this area to better structurally define these materials. Accordingly, mineral names have not been proposed for these materials.

The choice of minerals to include as chapters is inconsistent. One issue is that some clay minerals are apparently absent from the volume, notably volkonskoite, a smectite with Cr^{3+} as the dominant octahedral cation, and brinrobertsite, a regularly interstratified pyrophyllite-dioctahedral smectite phase. Another issue is one of completeness/consistency, where some sections have chapters for minerals, even if the literature is limited, but other sections do not include a chapter for minerals that lack full characterization. For example, each regular mixed-layer mineral is provided as a chapter, even if the mineral is not well described in the literature, suggesting that each mineral species is included for completeness. In contrast, only sepiolite and palygorskite are included under the heading of "Palygorskite and Sepiolite Clay Minerals", although the palygorskite-sepiolite *group* consists of ~10 mineral species (*e.g.* yofortierite, windhoekite, tuperssuatsiaite, raite, several of which have single-crystal, X-ray determinations of their structures). Although loughlinite (Na-rich sepiolite) is mentioned under sepiolite, no mention is made of these other minerals, not even in the chemistry description for palygorskite or sepiolite where reference to variations in chemical compositions would be appropriate. (In contrast, sauconite and swinefordite are two smectite minerals that are included in the chemistry description of the hectorite chapter, instead of separate chapters.) The incorporation of the entire palygorskite-sepiolite group is potentially useful to provide insight to the palygorskite-sepiolite structures and variations in chemical composition. Indeed, the use of comparative crystal chemistry was a highlight of the first-edition volumes and seminal to the development of modern insights to the structures of minerals, but such opportunities are often missed in this volume.

Another important issue is that the reader must look elsewhere to find information about thermodynamics or phase relationships of the various clay minerals. The preface to the volume does not specifically promise the inclusion of these topics, but the preface does indicate that the text covers "the nature and occurrence of these minerals in a mineralogical and geological context", so the minimal coverage of the thermodynamics/phase

relationships seems surprising. Interestingly, the oversight is not generally one of missing important references, but rather of referencing articles but not including or referring to the contributions to thermodynamic properties or phase equilibria within the articles. This problem extends to other areas as well, although not to the same extent, and thus some accuracy is lost in summarizing important previous work. Therefore, the list of references at the end of each chapter is more useful as a bibliography (a general list) rather than as a more comprehensive list where the reader may find specific information on minimally covered topics, in addition to fully covered material.

Randomly interstratified minerals undergoing X-ray powder diffraction may be described as having coherent scattering domains or "MacEwan-type particles" or alternatively, as thin "fundamental particles" that involve interparticle diffraction in sedimented oriented aggregates. Because the author was important in the development of the "fundamental particle" concept in describing illite-smectite interstratifications, the chapter on illite-smectite interstratifications could have been greatly one sided, but is not. Although the reader clearly knows the direction of tilt of the presentation, the treatment of the subject matter is reasonably balanced.

Recommendations regarding the possible purchase of this text are mixed. The usefulness of the text is greatly limited because important topics are not considered or minimally considered, as described above. In addition, the incomplete summary of many cited references makes it difficult to use the reference list as an effective resource. Nonetheless, this text remains an important reference for the advanced researcher who may be expanding to allied fields of study or in need of a review of topics adjacent to his/her expertise. In this regard, supplemental review of the cited references is advised to obtain a more global understanding of the subfield. The arrangement of research results by mineral species makes the text especially useful, and this may be a way to avoid having to research the topic *via* a search engine and then to summarize within topics.

Stephen Guggenheim
University of Illinois at Chicago

https://doi.org/10.1007/BF03406047 Published online by Cambridge University Press