

BOOK REVIEW

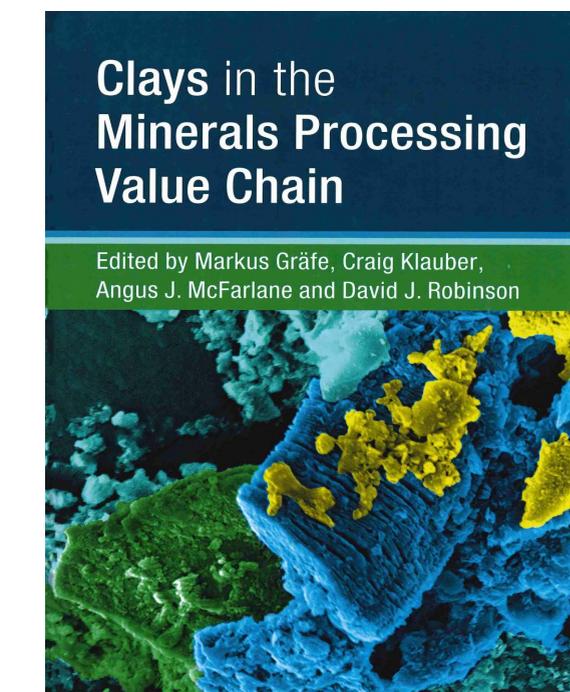
Book Review: *Clays in the Minerals Processing Value Chain*. (2017) Edited by Markus Gräfe, Craig Klauber, Angus J. McFarlane, and David J. Robinson. Cambridge University Press. 462 pages. \$152. <https://doi.org/10.1017/9781316661888>

Clays in the Minerals Processing Value Chain is the first specialized book that systematically addresses the challenges involved by the presence of clays in the performance of the mineral processing stages, connecting the main scientific findings with technical and operational aspects.

Each of the 10 chapters was created by leading specialists in their subject area, who provide fundamental knowledge in terms of identification, characterization, types of deposits, and the impact that clays generate in unit operations such as comminution, flotation, leaching, thickening, and tailings deposits. The editors and authors have worked together to interconnect the different chapters so they form a harmonious text, which does not appear as a series of isolated sections that drive to distant objectives.

A clear explanation in Chapter 1 leaves the reader to distinguish the different types of clays and to recognize them from other phyllosilicates, discussing the structural differences that would enable classifying according to their swelling and non-swelling nature. The swelling characteristics produce a sharp contrast in the influence different clays cause on operations. Chapter 4 summarizes useful methods for the characterization of the structures of particles, examining powder X-ray diffraction (XRD), the most widely used technique for the identification and quantification of clays. The information presented is self-sufficient, and it is not necessary for a reader to refer to a specialized text on spectrometry to understand the rest of the book.

Clays in the Minerals Processing Value Chain gives relevant knowledge on the phenomena that occur on a colloidal scale and their relationship with the bulk properties of mineral suspensions. This is an interesting combination since the macroscopic manifestations, which are of industrial relevance, are the result of the numerous interactions between the particles. For example, in Chapter 2 the authors combine the colloidal science with the macroscopic rheological properties of pulps, which is a key aspect to adequate management of mining tailings. Specific methodological criteria are described in detail. These criteria are especially useful because they are essential to carrying out a proper rheological characterization of concentrated slurries. This is particularly attractive as it clears up many misunderstand-



ings in the literature, being a master guide for those interested in delving into this issue.

In many regions, the availability of water controls the production of concentrates. In these cases, it is particularly necessary to improve the efficiency of water recovery. Clays are expected to lead the challenges in these operations, and this is addressed in a highly effective manner in Chapters 7, 8, and 9. These chapters focus on the impacts of different types of clays; however, the background provided by the authors is useful so that the reader can apply this in a broader scope than those that are explored in this text.

The main strength of this book is that the authors show highly specific detail, which requires mastery of theoretical frameworks that are made explicit throughout the text but written in a style that is accessible to non-experts. Therefore, it can serve as a reference for professionals, graduate students, or in the development of research projects.

There are high-quality images, but also explanatory and straightforward diagrams; for example, Figures 1.3 and 1.4 are

representations that help to differentiate clays from the rest of the phyllosilicates. These structural properties are then used to discuss the possible consequences in unit operations, such as its dissolution in the Bayer process (Figure 3.9) that impacts leaching processes, or the adsorption of flocculants on particle surfaces (Figure 8.5) that affects the stages involved in tailings management.

The last chapter organizes in detail the knowledge gaps and research priorities in this field. It projects research from theoretical perspectives in surface chemistry (since even theoretical models are insufficient to predict and reproduce empirical results) to practical matters in the unit operations. The authors demonstrate their understanding of the state-of-the-art on clay chemistry and particle–particle interactions identifying several

knowledge gaps that are systematically outlined. This undoubtedly facilitates and motivates the work of those who desire to do advanced research from a scientific point of view but with industrial relevance.

In summary, this book provides important context to readers so that they can have an informed judgment about the operational significance of the presence of clays, which is seen as a detrimental issue in the mineral processing value chain.

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