

- Vedder, W. and McDonald, R. S. (1963) Vibrations of the OH ions in muscovite: *J. Chem. Phys.* **38**, 1583–1590.
- Von Dreele, R. B. and Cheetham, A. K. (1974) The structures of some titanium and niobium oxides by powder neutron diffraction: *Proc. Roy. Soc. London A338*, 311–326.
- Wada, K. (1967) A study of hydroxyl groups in kaolin minerals utilizing selective deuteration and infrared spectroscopy: *Clay Miner.* **7**, 51–61.
- Wolff, R. G. (1963) Structural aspects of kaolinite using infrared absorption: *Amer. Mineral.* **48**, 390–399.

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BOOK REVIEW

Advanced Chemical Methods for Soil and Clay Minerals Research, edited by J. W. Stucki and Wayne L. Banwart. Volume C63 in the NATO Advanced Study Institutes Series, D. Reidel Publishing Company, Dordrecht (Holland), Boston, London, 1980, viii + 477 pp. \$58.00, Dfl. 110.

This book is based on lectures given at a NATO Advanced Study Institute held at the University of Illinois in 1979. It comprises ten chapters by thirteen experts from European countries and the United States who were lecturers at the Institute. In the preface the editors state that relatively few soil and clay scientists are intimately acquainted with these more recently developed methods because of "insufficient opportunities to explore in depth the working principles of (these) developments," and because "the necessary equipment generally is unavailable unless collaborative projects are undertaken." To these reasons the reviewer will add that the basic theoretical backgrounds lie largely outside the area with which most mineralogists are conversant. The present volume is especially welcome because it presents both the theoretical backgrounds of these techniques and detailed accounts of their applications in soil and clay mineralogy. Readers who find the theoretical discussion hard to follow will still appreciate the importance of the applications and therefore will be encouraged to participate in collaborative research which may well be the first step towards "exploring in depth the working principles"

The various methods discussed can be mentioned only briefly here. Chapter 1 on Mössbauer spectroscopy by B. A. Goodman, 93 pp., presents a short account of the basic theory and experimental procedures and then discusses at length applications to chain and layer silicates and oxides. Most of the clay minerals are mentioned ("crostedite," p. 38, is a new spelling for cronstedtite!). Application of the technique to mineral alteration reactions (natural weathering, chemical processes, and thermal reactions) is very usefully discussed. Chapter 2, on neutron scattering methods, by D. K. Ross and

P. L. Hall, 76 pp., gives an extensive theoretical treatment; about one-third of the chapter is allocated to applications, particularly to the clay-water system. Photoelectron spectroscopy is treated by C. Defosse and P. G. Rouxhet in Chapter 3, 35 pp., and by M. H. Koppelman in Chapter 4, 39 pp. The latter deals particularly with the chemistry of mineral surfaces. These two chapters are strongly application oriented. Nuclear magnetic resonance is dealt with in Chapter 5, 71 pp., by J. J. Fripiat, which is strongly oriented towards basic theory, and in Chapter 6, 13 pp., by W. E. E. Stone and J. Sanz which discusses applications of NMR to studies of micas. Electron spin resonance is treated in three chapters; Chapter 7, 59 pp., by J. C. Vedrine provides a detailed theoretical treatment, Chapter 8, 31 pp., by T. J. Pinnavaia discusses applications to inorganic-clay systems, particularly the behavior of interlayer cations in swelling clays, and Chapter 9, 28 pp., by M. B. McBride considers applications to clay-organic systems. Finally in Chapter 10, 15 pp., R. L. Schmidt introduces the reader to applications of photoacoustic spectroscopy.

In brief, this volume includes a wealth of information on the basic theory of these more recently developed methods and on their applications to soil and clay minerals which cannot be found elsewhere treated so fully and so conveniently. Each chapter has an extensive list of references. The paper, printing, and figures are all excellent. Doubtless an increased application of these methods in the study of clay minerals can be expected and sincere thanks must be expressed to NATO for sponsoring this Advanced Study Institute.

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