

Sedimentary Carbonate Minerals

James R. Kramer

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with the morphology and facies patterns of isolated reefs like those in the Devonian of Western Canada.

"Sedimentary Accretion along the Leeward Coast of Qatar" (p. 199-209) by E. A. Shinn describes how quartz sand is blown in dune fields for miles across supratidal flats before being deposited on the coastal sublittoral accretion slope. The result is a progradational wedge of quartz sandstone in an otherwise pure carbonate province, long a puzzle to Cambro-Ordovician stratigraphers in North America.

"Distribution and Ultrastructure of Holocene Ooids" (p. 279-328) by J. -P. Loreau and Purser is a wonderfully detailed contribution to a contentious subject. The great variety of settings in which ooids occur is stressed. The authors contend that the tangential orientation of aragonite needles in ooids results from impaction.

"Aragonitic, Supratidal Encrustations on the Trucial Coast" (p. 343-376) by Purser and Loreau points out a variety of laminated encrustations, termed "coniatolites", that resemble algal stromatolites but which are of inorganic origin. This adds to the growing list of structures such as caliche and tufa prone to misidentification as stromatolites in ancient carbonates.

Unfortunately, the statistically-defined facies described by the Kiel University team in the muddy northern part of the Gulf will be very difficult to apply to ancient rocks. Likewise, the studies of *sabkha* chemistry and diagenesis are too ambiguous for confident application to the ancient.

In all, the book is a triumph for Bruce Purser, both as editor and author. We should be grateful also to Springer-Verlag for their continued interest in the limited market of our profession.

MS received, April 11, 1974.

Sedimentary Carbonate Minerals

by F. Lippmann
Springer-Verlag, New York,
 228 p., 1973.
 \$21.50.

Reviewed by James R. Kramer
Department of Geology
McMaster University
Hamilton, Ontario L8S 4M1

The chapter headings are: Introduction, Crystal chemistry of sedimentary carbonate minerals, The polymorphism of calcite-aragonite, The system $\text{CaCO}_3\text{-MgCO}_3$, and Petrological summary: reaction series leading from carbonate sediments to carbonate rocks. The quality of reproduction is good, and the diagrams are clear and helpful. Literature references are numerous. The style of writing is clear, concise and objective.

This book is developed upon a strong mineralogical and crystal chemical base. The development of the material is an excellent example of the importance of understanding crystal chemical principles when interpreting natural phenomena. This relationship is developed particularly well with interpretation of aragonite ooids.

The first half of the text on crystal chemistry and mineralogy is a thorough review of the literature. Careful attention is paid to symmetry, ion spacing and comparison of various data. These crystallographic data are related directly to thermodynamic data and mineral stabilities.

The calcite-aragonite polymorphs are considered as to thermodynamic stability and metastability. Metastable formation of aragonite is discussed with respect to cations and with respect to occurrences in nature. The calcite-dolomite stability region is defined, and discussion involving hydrothermal origin as well as a magnesian calcite pathway is developed.

Lippmann then develops the excess carbonate or alkalinity hypothesis as a mechanism for formation of

dolomite. He relates this hypothesis to crystal chemical principles and shows how this theoretical concept is related to practical occurrences of dolomite. He also designates dolomites as organic if the excess alkalinity is due to the reduction of sulphate and oxidation of organic carbon. However, he does not calculate the amount of excess inorganic or organic alkalinity one may expect by these mechanisms.

I find it very difficult to make any negative criticism concerning the coverage of carbonate minerals and their genesis. The aragonite-calcite question and the calcite-dolomite problems are handled in depth and with great lucidity. Perhaps one can argue that organic effects upon nucleation are covered lightly, and one may be a bit frustrated that nucleation and metastability are alluded to as key processes, but never developed with the same rigour as other subjects.

All in all, I thoroughly enjoyed reading and studying the text. I found that I could comprehend the material readily. I highly recommend the text to the low temperature carbonate student and researcher, be he mineralogist, geochemist, sedimentologist or paleontologist.

MS received, June 18, 1974.