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## Stable Mineral Assemblages of Igneous Rocks

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A. Rittman  
*Springer-Verlag, New York*  
 262 p., 1973.  
 \$31.20.

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*Stable Mineral Assemblages of Igneous Rocks* is the seventh in the series, *Minerals, Rocks and Inorganic Materials*. It adds a new and lengthy dimension to the mechanics of naming a volcanic rock for the book is devoted largely to the calculation of a mode from a chemical analysis of an igneous rock. There is considerable advantage to the scheme in the naming of volcanic rocks which are glassy or too fine grained for conventional petrographic methods. The Rittman method provides a better approximation of such important indices as colour index and feldspar ratio than alternatives such as the CIPW or Niggli norms.

The initial two chapters of thirteen deal with the nomenclature of volcanic rocks. Professor Rittman accepts the Streckeisen classification although he presents some revision to incorporate his usage of the terms, high alumina basalt, tholeiite, alkali basalt and andesite. The term "igneous rock facies" is also introduced on the grounds that facies have been useful in the petrography of metamorphic rocks and they "should therefore be extended to igneous rocks".

Chapters three to ten describe the basis and method for determining the Rittman mode. The initial step involves the calculation of a "saturated norm" that is comparable in complexity to the calculation of a CIPW or Niggli norm. The "saturated norm" provides the basis for a considerably more complex calculation of the equilibrium mode, i.e., an idealized mode that approximates the mineralogy of a rock resulting from equilibrium crystallization. The calculation of the equilibrium mode is based on

empirically established relationships between the compositions of analyzed minerals and the "saturated norm" of the rocks in which the minerals occur. The lengthy calculation is given in step form and several examples are worked out in the text.

The final three chapters of the book were written by colleagues of Professor Rittman. These include a chapter comparing the Rittman mode with the CIPW norm by V. Gottini, a brief description of an ALGOL computer program for the computation of the Rittman mode by Hewers and Stengelin, and a description of the application of the Rittman method to petrologic problems by Pichler and Stengelin.

In summary, it must be said that the content of the book is of considerably less scope than the title might imply. The book is, in fact, a manual for the calculation of an idealized mode from a chemical analysis. The calculated mode is helpful in the classification of volcanic rocks but offers no advantage over the CIPW norm in studying petrochemical problems where variation in chemistry is of more interest than nomenclature. The calculation of the Rittman mode is of such complexity that few people will be prepared to work routinely through the procedure without the aid of a computer. The ALGOL computer program, which is described but not listed in the book, is therefore certain to be a major factor in determining whether or not the scheme is widely adopted.

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## The Black Sea - Geology, Chemistry and Biology

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Edited by Egon T. Degens and David A. Ross  
*AAPG. Memoir 20, Tulsa, Oklahoma*  
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 \$33.00.

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In 1969 the R/V *Atlantis II* of the Woods Hole Oceanographic Institution carried out a seven week expedition in the Black Sea to study the structural and sedimentary history and the geo- and biochemistry of this landlocked anoxic watermass and the seafloor beneath it. Results of this exercise, together with those of previous predominantly Soviet Black Sea cruises, were presented at Woods Hole in 1970, and led to the publication of this book, which contains 45 articles by 65 contributors. The new knowledge, resulting from the *Atlantis II* cruise, combined with earlier information from USSR, Turkish, Bulgarian and Rumanian sources has produced an impressive volume. The book thus will undoubtedly become the standard reference on the geology and geochemistry of the Black Sea, especially for the western world.

Although the terms "Chemistry" and "Biology" in the title might suggest differently, the book pertains almost solely to the geology of the Black Sea. The biological aspect, as discussed in the section "Biology", exclusively relate to stratigraphic and palaeo-environmental zonation of the bottom sediments. The book certainly does not describe or analyse the living biota of the watermass. Similarly, physical and chemical properties of the water column (and that includes interstitial waters) set the scene for the analysis of the early diagenesis of the sediments.

The first section, "Structure", defines the shallow and deep

structure of the Black Sea Basin and relates this to the geology of the surrounding land. In the section "Water" two papers demonstrate the importance of the Bosphorus, linking the Black and Mediterranean Seas throughout at least the Quarternary. Pleistocene changes in sea level reversed the flow of water through the Strait, changing the Black Sea from a brackish marine basin to a fresh water lake and back.

In the section "Sediments" the sedimentary regime is defined in time (Recent) and place, using different samples (collected respectively by the Russians prior to 1969 and by Atlantis II), different parameters (textural, mineralogical), different components (clastics and authigenic carbonates), and different techniques (grab and core bottom samples, bottom photographs). The Black Sea sediments are unique in many respects mainly because of climatic and geological conditions.

The section "Geochemistry" deals with the distribution of elements, with the changes of the sediments, and the enrichment or solution of minerals and organic compounds, that characterize the conditions in and immediately below the anoxic watermass.

The "Summary" synthesizes all contributions to the volume and provides an excellent overview of Black Sea Geology and Geochemistry. It is good to see in the introduction to this summary that there was room to dwell on the historical significance of the Black Sea, at the crossroads of Asian and European civilizations.

The book ends with a keyword index with more than 5000 entries. A conspicuous and unfortunate flaw in the book is the poor reproduction of some of the photographs, notably seafloor pictures and some illustrations of diagnostic microfauna and -flora.

Altogether a highly recommendable book that should be widely read.

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