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Chemical oceanography

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Hood, D.W.

Abstract

Few complete reviews dealing with all aspects of the field of Chemical Oceanography or in fact a concise definition of the meaning of the term have appeared in the literature, so that it is appropriate to begin this survey with the author's attitude concerning the subject-matter to be covered. It is considered that chemical oceanography is the study of the marine environment as a chemical system in which data from all other sciences are utilized to characterize and understand the chemistries involved. A broad approach of this type will of necessity be limited by space and time; however, an attempt is made to collate important work in this field within these limitations. Also, for this initial review of a series, a somewhat historical approach is made while attempting not to neglect the recent significant work. To be consistent with a broad point of view, areas in which considerable recent work has been done such as instrumentation, salinity measurements, radioactivity in the oceans, and marine geochemistry , will be deferred to other special reviews. The last general review of the physical and chemical properties of sea water appeared in The Oceans (Sverdrup, Johnson and Fleming, 1942); the large volume of literature appearing since that time has been surveyed by several books and reviews. Harvey's (1957) book on the Chemistry and Fertility of Sea Waters is largely devoted to biochemical processes and how they affect the marine environment. Apparatus and Methods of Oceanography by Barnes (1959) is a critical review of analytical methodology of constituents of sea water, whereas a manual of Sea Water Analysis by Strickland and Parsons (1960) gives specific methods for measurement of chemical parameters. Portions of treatises by Hedgpeth (1957) and Hutchinson (1957) and the two symposium volumes Oceanography (1961) and Prospectives in Marine Biology (Ed. Buzzati-Traverso, 1958) contain very valuable chapters summarizing specific aspects of the field. Two summaries considering the physical and chemical properties of ocean water by Richards (1957b) and Dietrich and Kalle (1957) consider rather general oceanographic problems. A compilation of important papers on physical and chemical properties of sea water has appeared in the National Academy of Science and National Research Council publication (1959) and finally the important review by Goldberg (1961) on marine geochemistry considers fully the reaction chemistry of ocean water with special emphasis on phase boundaries.

Vlaams Instituut voor de Zee | InnovOcean site | Wandelaarkaai 7, 8400 OOSTENDE, België
Tel.: +32-(0)59-34 21 30 | Fax: +32-(0)59-34 21 31 | e-mail:info@vliz.be | BTW BE 0466.279.196 | privacy en cookiebeleid

Chemical oceanography can be further divided into focused areas of study. For example, marine chemistry is concerned with the composition of sea water. Marine geochemistry is additionally concerned with the chemistry of the precipitated rocks and sediment found on the ocean floor. Additionally, marine biogeochemistry is concerned with the role of organisms (particularly microorganisms) in the alteration or formation of geological features in the oceans. Water and sediment sampling are at the heart of chemical oceanography.