
Dissertations

Copper tetrapyrrole complexes in the marine environment

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The aim of this work was to show that copper and chlorophyll, apparently very different components of the marine environment, are both engaged in a biogeochemical cycle in the sea and that their distributions are in part interrelated. The hypothesis was put forward that the unidentified organic ligands known to form stable complexes with copper in seawater have a tetrapyrrole structure. This hypothesis was tested on the basis of the literature data and experimental results concerning the distribution of copper, chlorophyll and its derivatives, and copper tetrapyrrole complexes in the water, sediment and phytoplankton of the Baltic Sea. Apart from these environmental studies, model laboratory experiments were carried out on unicellular algal cultures to determine the possibility and conditions of formation of copper tetrapyrrole complexes.

The results suggest that copper takes part in the biogeochemical cycle of chlorophyll in the sea. It forms complexes with the chlorin macrocycle at the surface, and is then released in sediments or at the water-sediment interface, especially under anoxic conditions, and at the sea surface under the influence of solar radiation. Living phytoplankton cells would be the source of such complexes in the marine environment.

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