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Internal load management in eutrophic, anoxic environments. The role of natural zeolite.

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During the last decades, the increase of the nutrient and organic load inflows in the coastal zone increased the number of the anoxic environments. Inputs' control constitutes one of the basic practices for the eutrophic/anoxic aquatic ecosystems management. However, the induced changes at the ecosystem characteristics resulting from the trophic state alteration, and anoxic conditions prevalence, render the ecosystem's restoration difficult if not impossible.

Bottom water anoxia accelerates PO43-, NH4+ and S2- recycling and accumulation from organic matter decomposition. This, toxic layer is a permanent menace for the balance of the entire ecosystem, as it can supply PO43-, NH4+ and S2- to the surface layers altering their qualitative character and threatening the welfare of fishes and other aquatic organisms.

Having as objective the water basins' internal load control and based on practices are used in eutrophic environments' restoration, this study is referred to the role of the natural zeolite in eutrophic/anoxic ecosystems management. For the first time are presented, results from S2- removal experiments using the zeolitic mineral mordenite, [(Na2, Ca, K2)4 (H_2O)28] [Al8Si40O96].

Four different sets of experiments were conducted, in order to examine zeolite's removal capacity of S2- in aquatic solutions, under a wide range of physicochemical parameters. More specific: a) the effect of initial pH on the removal process, b) the removal process kinetics, c) the removal process isotherms and d) the effect of salinity on the removal process were studied.
Natural zeolite has the ability to neutralize the pH of aqueous solutions, thus all the experiments were practically performed at pH 7. Initially sulfides concentration range from 1 to 10mg/l. Zeolite's removal capability appeared to be directly depended on the S2- initial concentration. For initial concentration of 1mg/l, the removal rate reached up to 90% after 24h. The maximum zeolite removal capacity was calculated equal to 123.1 10-3 mg/g S2-. Zeolite removal capacity varied by about 10% as the solution's salinity varied from 0 to 35‰.

This study emphasizes in the zeolite ability to remove dissolved sulfides from aqueous solutions. According to literature, natural zeolite is particularly effective in removing ammonium from aquatic solutions, while due to its negative charge zeolite doesn't adsorb phosphate ions. However, in the presence of cations (Ca+2, Na+, K+) in the aquatic solution it turns to the appropriate substrate for the formed phosphate salts.

In conclusion, zeolite is a natural inert material, capable to remove from aqueous solutions forms of nitrogen, phosphorus and sulfur. Due to this ability zeolite could play a key role, in eutrophic/anoxic environments restoration efforts, since PO43-, NH4+ and H2S constitute the three aspects of the problem called anoxic basins' internal load.