

Mn-54 IN SEAWATER: CHELATION AND ADSORPTION ON PARTICULATES

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Summary

Interaction of Mn-54 with humic and fulvic acid as well as with EDTA in estuarine and seawater were studied using high voltage paper electrophoresis. Experiments were performed in estuarine and 10% seawater. The results are important for manganese speciation in estuarine waters and for manganese transport and accumulation in sedimentary deposits.

Résumé

Les interactions en eau de mer entre le Mn-54 et des acides humiques et fulviques et EDTA ont été étudiées par électrophorèse à haute tension, sur papier. Les expériences ont été réalisées dans l'eau d'estuaire et l'eau de mer à 10%. Les résultats soulignent l'importance de la matière organique pour la spéciation du Manganèse en milieu estuarien, pour le transport et l'accumulation du Manganèse dans les dépôts sédimentaires.

The abundance of natural humic substances and their ability to form metal complexes¹ make marine material specially important in the transport, availability and accumulation of trace elements in marine environment. The present study deals with the interaction of Mn-54 and humic and fulvic acid of different origin in estuarine and seawater. One humic acid sample was isolated from the marine sediment from the Pacific-Borneo, Mahakam, one sample from the estuarine sediment from the Adriatic Sea, the Lim Channel, and one fulvic acid sample from lagoon sediments, Gulf of Lion - Perpignan, Canet. The estuarine and seawater, originating from the Adriatic Sea, was filtered through a 0.45 μ m membrane filter, EDTA, as strong complexing agent was also added to estuarine and seawater in order to compare the complexing ability of humic acid to Mn-54. The concentration of humic and fulvic acid as well as of EDTA was varied from 5 to 200 mg/l, and 0.1 to 200 mg/l, respectively. The pH was adjusted to 8.0. The behaviour of Mn-54 was followed up by measuring its electrophoretic mobility as a function of humic acid (fulvic acid, EDTA) concentration and aging of the system up to 30 days.

Without the addition of humic acid to estuarine and 10% seawater Mn-54 introduced in the system as Mn(II) remains almost completely in the cationic form over a period of one month. By adding complexing agents to the systems (EDTA, humic or fulvic acids), Mn-54 changed its physico-chemical form to anionic and/or uncharged forms.

In the case of the EDTA added to the estuarine and seawater, Mn-54 gives a well-defined anionic zone at the EDTA concentration of 5×10^{-5} M (20 mg/l), but anionic tailing exists at the EDTA concentrations of 5×10^{-7} M (0.2 mg/l), which is in agreement

with results published earlier².

Depending on the concentration of humic and fulvic acids added to estuarine and seawater, Mn-54 shows: a) tailing of the cationic zone to the anionic direction; b) a zone at the starting point which does not move in the electric field; c) at older systems and at higher humic and fulvic acid concentrations some anionic zones or tailing. These effects are noticeable at much higher humic and fulvic acid concentrations (5-200 mg/l) than in the case of EDTA.

Adsorption of Mn-54 on the suspended material isolated from estuarine water is rather strong and concentration factors (log K values) vary from 4.1 to 3.9 depending on the concentration of stable manganese (1-150 $\mu\text{g/l}$).

References

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2. Musani-Marazović Lj. and Pučar Z. (1977), The Interaction of ^{54}Mn and $^{55(59)}\text{Fe}$ with EDTA in Seawater and 0.55 M NaCl Solutions, Mar. Chem. 5, pp. 229-242.

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