

PIXE Analysis for the Bioaccumulation of Several Trace Metals by Marine Micro-Alga

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Abstract

Bioaccumulation by micro-alga in the ocean was simulated in nutritive seawater containing known amounts of trace metals, and the concentration factors for Fe, Zn and Cd were measured by PIXE. Trace transition metals in nearshore seawater were removed by Chelex-100. Then a culture solution was prepared by adding known amounts of trace metals and nutritive salts to the purified seawater. Marine micro-algae (*Nannochloropsis sp.*, and *Phaeodactylum sp.*) were purely cultured in the culture solution. An interested metal ion was added to the culture solution (0.01 - 5.0 mg/L). Alga in 10 ml of the culture solution was collected on a polycarbonate filter (pore size: 1.0 μm) by suction filtration and subjected to 2.9 MeV proton bombardment. Na, Mg, Al, Si, P, S, Cl, K, Ca, Cr, Mn, Fe, Zn and Cd were simultaneously determined. PIXE multi-element analysis was possible using less than 1 mg of analytical sample. The quantity of the metal in the alga was increased in proportion to the concentration in the culture solution. The concentration factors for Zn, Fe and Cd were measured, e.g., 10200 ± 300 mL/g to Zn for *Phaeodactylum*. The trend of the affinity for the trace metals in the case of *Nannochloropsis* was $\text{Fe}^{3+} > \text{Zn}^{2+} > \text{Pb}^{2+} > \text{Cd}^{2+}$.