Evaluation of the Metal Uptake of Several Algae Strains in a Multicomponent Matrix Utilizing Inductively Coupled Plasma Emission Spectrometry

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Three freshwater heat-killed, lyophilized blue-green algae strains have been characterized as to their ability to accumulate heavy metals with a focus on the utilization of these algae as an analytical preconcentration technique. This study examines the metal uptake in several multicomponent mixtures by using inductively coupled plasma optical emission spectrometry (ICP-OES). Six milligrams of a pure strain of algae was added to 20-mL aliquots of buffered (pH 5.5–6.5) multielement solutions containing 0.1, 0.5, 1.0, 2.0, and 4.0 mg/L of K, Mg, Ca, Fe, Sr, Co, Cu, Mn, Ni, V, Zn, As, Cd, Mo, Pb, and Se. All three algae strains exhibit relatively high adsorption affinities for Fe, Pb, and Cu, with uptake between 70 and 98% at the 4 ppm concentration level. Biosorption occurs for essentially every element with the relative affinities decreasing in the order Pb > Fe > Cu > Cd > Zn > Mn > Mo > Sr > Ni > V > Se > As > Co for *Chlorella pyrenoidosa* at the 4 mg/L concentration level. Although some minor differences were seen, the other algae strains (*Stichococcus bacillaris* and *Chlamydomonas reinhardi*) displayed similar adsorption behavior over the concentration range studied, indicating similar cell wall binding sites. Langmuirian isotherms exhibited a minimum of two slopes over the concentration range of 0.1–4.0 mg/L, indicating the probable existence of at least two adsorption mechanisms.