Cd (II) removal by marine *Arthrobacter protophormiae* biomass: mechanism characterization and adsorption performance

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Received 10 October 2012; Accepted 25 February 2013

**ABSTRACT**

Biomass of *Arthrobacter protophormiae* was used to remove Cd (II) from aqueous solution. The interaction of Cd (II) with *A. protophormiae* biomass was investigated by environmental scanning electron microscopy coupled with energy dispersive X-ray analysis and FTIR spectroscopy. Atomic force microscopy (AFM) used in the tapping mode elucidated the morphological changes in bacterial cells following Cd (II) binding. Adsorption of Cd (II) by biomass was investigated to quantify adsorption kinetics, adsorption capacity, and the effect of solution pH. The applicability of the Langmuir and Freundlich models was tested. The maximum adsorption capacity was found to be 31 mg/g for Cd (II) at 25˚C. The adsorption process was found to follow the pseudo-first-order equation. The involvement of cellular phosphate and carboxyl groups in Cd (II) binding was ascertained by FTIR spectroscopy. Results indicate that a chemical interaction could be involved in Cd (II) sequestration by this bacterium. AFM analysis revealed that adsorption of Cd (II) onto biomass induced substantial modification on cell surfaces.

**Keywords:** *Arthrobacter protophormiae*; Cd (II); AFM; Sequestration; Characterization