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Adsorptive removal of cadmium (II) using *P. oceanica* biomass: effect of NaCl concentration on equilibrium and kinetic parameters

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ABSTRACT

In this study, biosorption of cadmium (II) from saline solutions by *Posidonia oceanica* (L.), a marine biomass, was studied as a function of pH, initial cadmium (II) and NaCl concentrations in a batch system. The sorbent exhibited the maximal cadmium (II) uptake at pH 6 in the absence and in the presence of increasing concentration of NaCl. Equilibrium uptake increased with the cadmium (II) concentration up to 250 mg/L and diminished considerably in the presence of increasing concentrations of salt up to 50 g/L. At 100 mg/L, initial cadmium (II) concentration, *P. oceanica* biosorbed 15.69 mg/g of cadmium (II) without salt medium. When NaCl concentration was raised to 50 g/L, this value dropped to 6.87 mg/g of cadmium (II) at the same conditions resulting in 56.21% decrease in biosorption capacity. The equilibrium sorption data were analysed by using Freundlich, Langmuir and Redlich–peterson models. Langmuir was the most suitable adsorption model for describing the biosorption equilibrium data of cadmium (II) both individually and in salt-containing medium. Pseudo-second-order kinetic model also fitted well to both systems viz. cadmium (II) and cadmium (II) + NaCl. Isotherm constants varied due to the level of salt were expressed as a function of initial NaCl concentration.

Keywords: Biosorption; Cadmium (II); *P. oceanica*; Salt; Isotherm; Modelling

1. Introduction

Heavy metal ions have become an ecotoxicological hazard of prime interest and increasing significance, because of their accumulation in living organisms [1]. Cadmium (II) is attracting wide attention of environmentalists as one of the most toxic heavy metals. The major sources of cadmium (II) release into the environment by waste streams are electroplating, smelting, alloy manufacturing, pigments, plastic, battery, mining and refining processes [2]. The harmful effects of cadmium (II) include number of acute and chronic disorders such as "itai–itai" disease, renal damage, emphysema, hypertension and testicular atrophy [3].

Considerable research has been carried out in developing cost-effective heavy metal removal techniques. Physicochemical methods, such as chemical precipitation, chemical oxidation or reduction,

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