



Biosorption of hexavalent chromium by free and immobilized dead *Sargassum sp*: a study on isotherms and kinetics

Sheryll Judith Dsilva^{a,†}, Ashish A. Prabhu^{b,†}, B.C. Suhas^a, B.E. Rangaswamy^a, Venkata Dasu Veeranki^{b,*}

^aDepartment of Biotechnology, Bapuji Institute of Engineering Technology Davangere, Karnataka, India, emails: sheryll.biotec@gmail.com (S.J. Dsilva), suhasbc.Biet@gmail.com (B.C. Suhas), swamyber@hotmail.com (B.E. Rangaswamy)

^bBiochemical Engineering Laboratory, Department of Biosciences and Bioengineering, Indian Institute of Technology Guwahati, Assam, India, email: ashishbiotec@gmail.com, Tel. +91-361-258 2212; Fax: +91-361-258 4212; email: veeranki@iitg.ernet.in

Received 24 January 2016; Accepted 12 July 2016

ABSTRACT

In the present investigation, batch studies were carried out to remove hexavalent chromium (Cr(VI)) from the aqueous solution using *Sargassum sp* biomass in free and immobilized form. The effect of various operating parameters such as pH, biomass dosage, temperature and initial Cr(VI) concentration was studied. Two and three parameters isotherm models were used to fit the equilibrium data and regeneration studies were carried out for reusability of *Sargassum sp* biomass. Three parameter models showed better fit for immobilized *Sargassum sp* biomass ($R^2 > 0.995$). Among two parameter models, Langmuir model was found to be the best fit for the experimental equilibrium biosorption data with the predicted maximum total Cr(VI) biosorption capacity of 41.67 and 71.42 mg/g for free and immobilized *Sargassum sp* biomass, respectively. The pseudo second order model was better described ($R^2 > 0.9$) the Cr(VI) biosorption kinetic data for both free and immobilized biomass. The Fourier transform infrared spectroscopy suggested that amido-, hydroxyl-, C=O and C—O groups were involved in the biosorption of Cr(VI). This study showed that *Sargassum sp* biomass was an attractive and efficient biosorbent that could have been used as an alternative to treatment.

Keywords: *Sargassum sp*; Hexavalent chromium; Immobilization; Isotherm; Kinetics

* Corresponding author.

† Authors with equal contributions.