

Removal of Cd²⁺ and Cu²⁺ by free and immobilized *Saccharomyces cerevisiae*: kinetic and equilibrium modeling

Ramiro Martins^{a,b,*}, Rui Boaventura^b

^a Dep. of Chemical and Biological Technology, Superior School of Technology
University of Applied Sciences of Bragança
Campus de Santa Apolónia, 5301-857 Bragança, Portugal

^b LSRE-Laboratory of Separation and Reaction Engineering
Faculty of Engineering, University of Porto
Rua Dr. Roberto Frias, 4200-465 Porto, Portugal

* Author to whom all correspondence should be addressed
phone: (+351) 273303091; Fax: (+351) 273313051; Email: rmartins@ipb.pt

T8 (8.7) Agua en la industria

This study investigated the biosorption characteristics of Cd²⁺ and Cu²⁺ on free and immobilized *S. cerevisiae*, including kinetics, isotherm adsorption, pH, co-ions influences, competing adsorption and desorption etc.

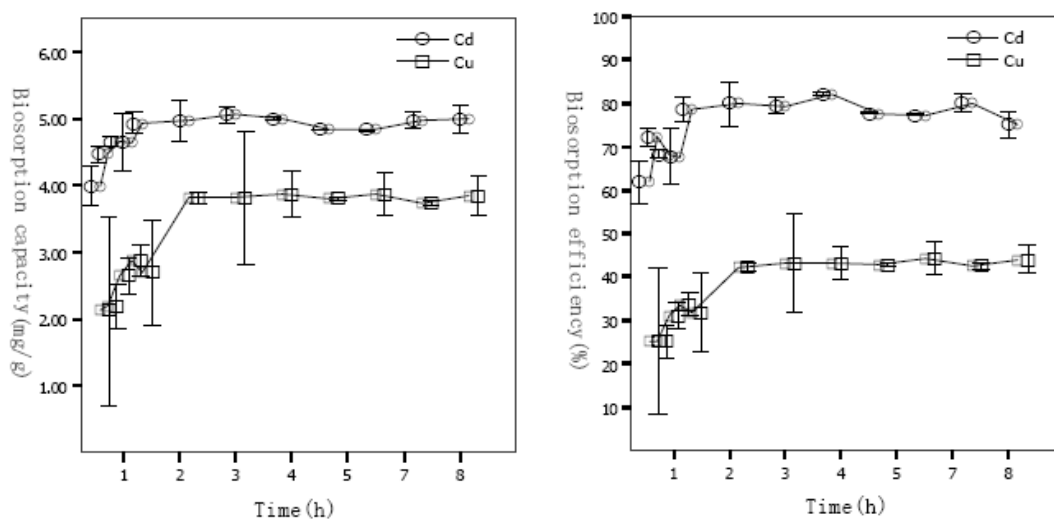


Fig.1. Biosorption of Cd²⁺ and Cu²⁺ on free *S. cerevisiae* at different contact time

The results showed that five equations are fitted well for experimental data, in which the best equation for biosorption of free *S. cerevisiae* was Second-order kinetic equation for Cd^{2+} and Elovich equation for Cu^{2+} , respectively. For immobilized *S. cerevisiae*, the Elovich model had best fit experimental data for Cd^{2+} , and for Cu^{2+} , the Langmuir model was more in correlation with the experimental data. The maximum biosorption capacity of unit biomass was observed at pH 4.

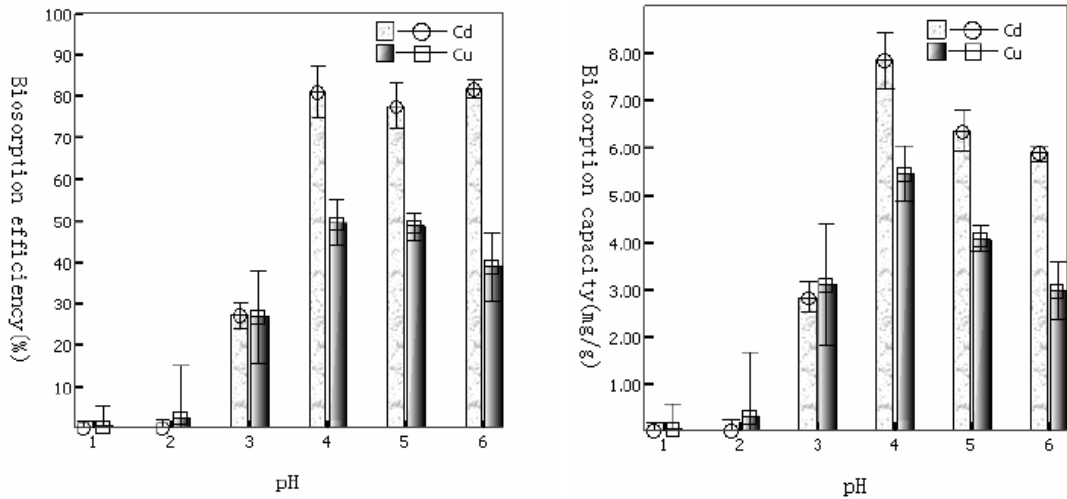


Fig.2. Effect of pH on biosorption of Cd^{2+} and Cu^{2+} by free *S. cerevisiae*

The isotherm adsorption process of Cd^{2+} and Cu^{2+} could be simulated by Linear equation, Langmuir equation and Freundlich equation. The co-ions K^+ , Ca^{2+} , Na^+ and Mg^{2+} would affect the removal of Cd^{2+} and Cu^{2+} at higher 5 mg/L. The disturbing heavy metal Zn^{2+} , Fe^{2+} , Cd^{2+} or Cu^{2+} , Pb^{2+} ions also would have negative effect on biosorption of Cd^{2+} and Cu^{2+} . Moreover, the immobilized *S. cerevisiae* adsorbed Cd^{2+} and Cu^{2+} could be regenerated and reused by the simple desorbent treatment.

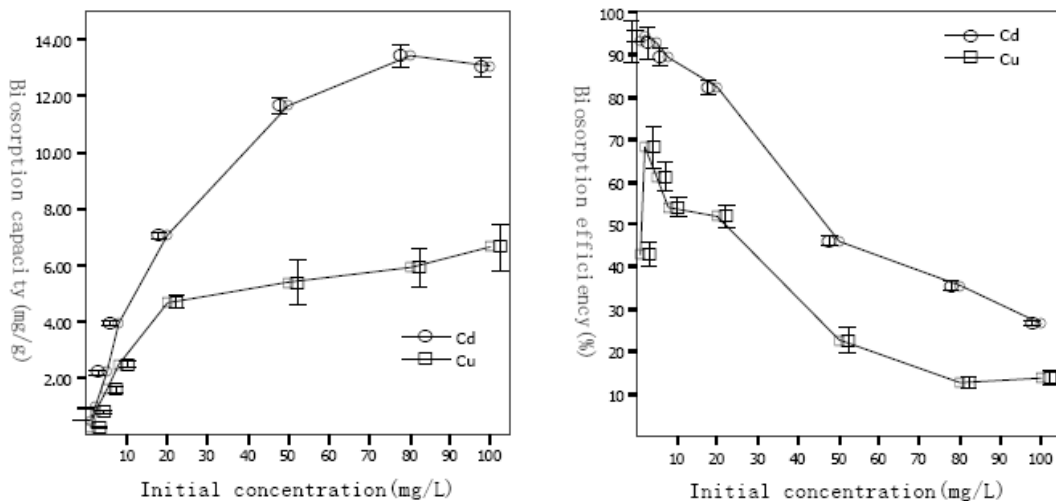


Fig.3. Effect of initial concentration on biosorption of Cd^{2+} and Cu^{2+} by free *S. cerevisiae*