#

BIOSORPTION OF HEAVY METALS USING INACTIVED FUNGI BIOMASS

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Introduction. The majority of toxic metal pollutants are waste products of industrial and metallurgical process. According to the World Health Organization (1), the metals of most immediate concern are Cd, Cr, Co, Cu, Pb, Ni, Hg and Zn. Removal of toxic heavy metals from industrial waste waters is essential from the stand point of environmental pollution control (2). The need for cost effective process and safe method for removing heavy metals from discharging effluents has resulted in search for other unconventional materials such as organic or inorganic sorbents (3). The use microbial biomass of fungi (4) for removal of heavy metals from aqueous solutions is gaining increasing attention. It has been found that both living and dead microbial cells adsorb metals ions. The purpose of this investigation was to study the biosorption of Pb(II), Cd(II) and Cr(VI) ions from aqueous metal ion solutions using dead biomass of *Rhizopus* sp. and *Alternaria* sp.

Methods. In this study *Rhizopus* sp. and *Alternaria* sp. cells were cultivated using nutrient broth media at room temperature and 200 rpm. The media was inoculated with about 2 x 10^6 conidies/mL. Cultivation period was about 7 days. After cultivation, cells were harvested by centrifugation (4000rpm/15 min) and then dried in oven at 60°C for 48 h. the dried biomass was grounded with a mortar and pestle. Kinetic experiments were conducted in continuously stirred tubes containing 10 mL of heavy metals solutions (100 mg/L) and 0.1 g of biosorbent (pH 5). At scheduled time intervals a sample tubes were out and the concentrations of the residual heavy metals were analyzed. The percentage removal of heavy metals was analyzed by AAS (Thermo Sci#CE 3300AA Spectrometer).

Results. The kinetic data were analyzed in term of the pseudo-second order. Figure 1 showed the plots of t/q vs t of Cd, Cr and Pb to *Alternaria* sp. and *Rhizopus* sp. The data shows that *Alternaria* sp. reaches equilibrium in the first 5 minutes of contact on all metals tested first while *Rhizopus* sp. stabilizes about 60 minutes of contact.

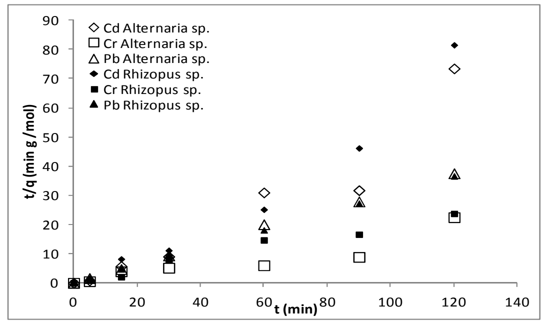

Fig.1 Linearized pseudo-second order kinetics.

The values of k_2 and q_e were presented in table 1. The adsorption of Pb(II), Cd(II) and Cr(VI) onto *Rhizopus* sp. and *Alternaria* sp. followed the second order model very well (R^2>0.952) and based on assumption that the rate limiting step may be chemisorptions involving valences forces through sharing or exchange of electrons between sorbent and sorbate

Table 1. The pseudo-second order adsorption constant.

	Metal	q_e (mol/g)	k_2 (g/mol/min)
Alternaria sp.	Cd	1.581	1.650
	Cr	5.074	0.089
	Pb	3.295	0.899
Rhizopus sp.	Cd	1.815	1.065
	Cr	6.557	0.093
	Pb	3.192	0.726

Conclusions. This study shows that *Rhizopus* sp. and *Alternaria* sp. are highly potential to be used for the removal of Cd, Cr and Pb which is also a viable, eco friendly and cost effective technology for cleanup of heavy metals.

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