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Removal of arsenic anions by adsorption onto free and immobilized fungal materials

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As(V) contamination in water sources poses a threat to both humans and the environment because of its high toxicity and potential adverse health effects. Traditional water treatment techniques have drawbacks such as inefficiency in arsenic removal, high capital and operational costs [1, 2]. Biosorption and bioremediation can provide effective and inexpensive alternatives for As(V) removal [3]. Mucor rouxii, a filamentous fungus previously reported as an efficient biosorbent in Pb(II) removal [4], was investigated as a potential biosorbent for the removal of As(V) ions in aqueous phase. The As(V) removal capacity of M. rouxii was found significantly improved after immobilization through cross-linking between the carboxymethyl cellulose (CMC) and Fe(III). Batch biosorption experiments were conducted to examine the influences of solution pH, biosorbent dosage, initial As(V) concentration and contact time on As(V) removal by CMC-immobilized M. rouxii beads (CMCMR). The uptake of As(V) increased with the equilibrium As(V) concentration, and the Sips isotherm could best described the equilibrium data. The As(V) uptake increased gradually with the contact time, and the pseudo-second kinetic model provided the best simulation of the biosorption kinetics. Simulation of kinetic data of CMCMR with the intraparticle diffusion model revealed that intraparticle diffusion should be the predominant rate-limiting step in the As(V) biosorption process. The integrated results from FTIR, SEM-EDX and XPS analyses indicated the involvement of protonated amino groups and possible ion/ligand exchange between As(V) and other ions coordinated with Fe(III) on CMCMR in the As(V) uptake. The effective removal of anionic As(V) by CMCMR in the current study demonstrates the great potential of this biomaterial for the treatment of As(V)-laden water and wastewater.

Biography

Yan-Yan Lam received her Bachelor of Science degree in Chemical Technology and PhD degree from the Hong Kong Polytechnic University (PolyU) in 2009 and 2015, respectively. Her research interest focuses on the development and application of biomaterials for removal and recovery of water pollutants. She participated in three different international conferences for presenting her research work on the utilization of fruit wastes and fungal materials for removal of heavy metals from aqueous media.

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