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Depletion of carcinogenic Cr (VI) from aqueous solution by heat dried biomass of a newly isolated fungus *Arthrinium malaysianum*: A mechanistic approach towards 'Green Science'.

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The rapid industrialization and economic growth has brought many benefits to India, but the environment has suffered a lot culminating serious health issues. Chromium, Arsenic and Lead are the major pollutants in industrial effluents that affect human health by adsorption through skin and by accumulating in the food chain. Hence, there is always a surge for an alternative eco-friendly solution. Here, for the first time, the heat dried biomass of a newly isolated fungus *Arthrinium malaysianum* was studied for the toxic Cr(VI) adsorption involving more than one mechanism like physisorption, chemisorption, oxidation-reduction and chelation. The process was best explained by the Redlich-Peterson isotherm and pseudo-second order kinetic model with maximum predicted biosorption capacity (Q_m) of 100.69 mg g^{-1}. Film-diffusion was the rate-controlling step and the adsorption was spontaneous, endothermic and entropy-driven. The mode of interactions between Cr(VI) ions and fungal biomass were investigated by several methods [FT-IR, X-ray Diffraction (XRD) and Energy-Dispersive X-ray spectroscopy (EDX)]. X-ray Photoelectron Spectroscopy (XPS) studies confirmed significant reduction of Cr(VI) into non-toxic Cr(III) species. Further, a modified methodology of Atomic Force Microscopy was successfully attempted to visualize the mycelial ultra-structure change after chromium adsorption. Influence of pH, biomass dose and contact time on Cr(VI) depletion were evaluated by RSM. Additionally, FESEM-EDX analysis exhibited arsenic (As) and lead (Pb) peaks on fungus surface upon treating with synthetic solutions of $NaAsO_2$ and $Pb(NO_3)_2$ respectively. The biomass could remove chromium from industrial effluents, suggesting the fungal biomass as a promising adsorbent for toxic metals removal.

Biography

Rajib Majumder, is a Postdoctoral Fellow at CSIR-Indian Institute of Chemical Biology (CSIR-Govt. of India). He did his Ph.D. from University of Calcutta, India. He has published three 1st author papers and other five (5) co-author papers to his credit in diverse research fields. His research interest is focused on the synthesis of metal nanoparticles using microorganism as a living nanofactory and its wide application in pollution control management.