Degradation of Chromium (VI) from Wastewater via Biological Route Using Inverse Fluidized Bed Reactor

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Abstract

In the present work, Cr (VI) has been degraded from wastewater by using an inverse fluidized bed reactor (IFBR) through biological route. For the experimentation, a mixed type bacteria was cultured in the laboratory by using the bacteria present in the wastewater sample collected from mines. Initial hydrodynamic study was carried out using mine-water in IFBR containing poly-propylene beads up to certain bed height. The minimum fluidization velocity for liquid medium and optimum air flow rate were determined as 0.0071 m/s and 0.042 m3/h respectively. The mixed bacteria culture was inoculated in IFBR for a particular concentration of synthetic wastewater. The experiments were performed at these velocities for different concentrations of Cr(VI) varying from 1ppm to 10 ppm. The samples collected at different time intervals were analysed to measure the Cr(VI) concentration using UV-Spectrophotometer. The Cr(VI) degradation efficiency was found to be in the range of 98.9% to 99.3% for synthetic water sample and 77.6%. for mine-water sample. Formation of bacteria layer on the surface of polypropylene beads was confirmed through confocal microscope. Various other characterizations like, SEM, EDX and FTIR were carried out by analysing bacteria samples before and after the experiments. The changes in morphology, elemental analysis and functional groups on the surface of bacteria before and after the experiments confirmed degradation of Cr (VI). The experimental results indicated the effectiveness of IFBR for the wastewater treatment for removal of Cr (VI) implying its suitability for removal of other heavy metals from industrial effluents in an eco-friendly manner.

Keywords

Degradation of Cr (VI), Waste water treatment, Inverse fluidization, Biosorption.