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SUSTAINABLE CHROMIUM(VI) SEQUESTRATION USING PROSOPIS JULIFLORA BARK: A NOVEL ECO-FRIENDLY APPROACH

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Abstract

The current work emphasizes on the efficiency of acid modified *Prosopis juliflora* barks (PJB) for the removal of Cr(VI) from wastewater. The physio-chemical characteristic studies of the sorbent material are carried out to determine its pH, conductivity, density, moisture content (Xylene method), ash content, specific gravity and porosity. The dried barks are treated using various reagents to enhance the adsorption efficiency, amongst which the HCl modified PJB exhibits maximum removal capacity. Surface morphology of modified PJB is characterized using Scanning Electron Microscopy (SEM). Involvement of functional groups, surface area and pore structure determination are examined using Fourier Transform Infrared (FTIR), Brunauer-Emmet-Teller (BET) and Barrett-Joyner-Halenda (BJH) methods. Energy Dispersive X-ray Analysis (EDAX) is carried out to explore its elemental composition, in order to assess the sorption capacity of modified PJB, various operating parameters such as particle sizes, doses of the sorbent material, initial concentrations of Cr(VI) at different temperatures, contact time and pH of the Cr(VI)-modified PJB system are carried out. The applicability of the Langmuir, Freundlich and Tempkin isotherms to verify the experimental results at various initial concentrations reveal that Langmuir model offers the best straight line fit. The maximum sorption capacity(C_e) of modified PJB is found to be 22.63 mg/g. In addition to this, column experiments is performed for quantitative estimation of modified PJB to trap Cr(VI) from aqueous environs and effluent wastewaters Further validation ensures reproducibility, efficiency, and scalability of TPJB for Cr(VI) removal, making it a reliable adsorbent in real-world wastewater treatment systems. To maximize the exploration of potential modified PJB, electroplating industry wastewaters are tested for Cr(VI) contamination and its mitigation is achieved through optimized batch/column performances.

Key words: batch mode, characterization, chromium ions, column mode, isotherms, industrial effluent

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