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Studies on biosorption of Cr(VI) on a green resin: dry cow dung powder and tracer technique

By N. S. Barot and H. K. Bagla*

Nuclear and Radiochemistry Department, Kishinchand Chellaram College, Dinshaw Wachha Road, Churchgate, Mumbai-400020, India

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Summary. The present investigation entails the application of dry cow dung powder (DCP) as an indigenous, inexpensive and eco-friendly material for the removal of Cr(VI) from aqueous medium. Batch biosorption experiments were conducted employing ^{51}Cr(VI) as a tracer and the effect of various process parameters such as optimum pH, temperature, amount of resin, time of equilibration, agitation speed, concentration of metal ions and interfering effect of different salts *etc.* were studied. The kinetic studies were carried out employing various models but the best fitting was given by Lagergren Pseudo-second order model with high correlation coefficient R^2 value of 0.997 and adsorption capacity of 10.20 mg/g. The thermodynamic parameters for biosorption were evaluated as $\Delta G^\circ = -2.837$ kJ/mol, $\Delta H^\circ = -4.757$ kJ/mol and $\Delta S^\circ = 16.64$ J/mol K, which indicated spontaneous and exothermic process with high affinity of DCP for Cr(VI). Many naturally available materials are used for the biosorption of heavy metal pollutants, where most of them are physically or chemically modified. In this research work, DCP has been utilized without any pre or post

and have disadvantages such as incomplete metal removal, high requirement of energy and reagents, generation of toxic sludge or other waste materials which in turn require treatment for their cautious disposal, adding on to the cost, time and feasibility of the entire procedure. To combat against the water pollution and to find a sustainable solution, globally, a green chemistry approach has been adopted. Among all the separation techniques, adsorption is the most promising one for the removal of a heavy metal pollutant due to its theoretical as well as practical simplicity, rapidity and most crucial its feasibility.

In the application of adsorption, bio-sorption is becoming more popular due to its mechanism which is based on non-directed physico-chemical interaction that occurs between metal species and dead biomass. Biosorption deals with both living biomass as well as non-loving aggregates of biomaterial. Biosorption by dead biomass is often faster, since only passive cell wall based binding transport into the cell takes place. Another advantage of using dead biomass is the easier and non-destructive recovery [7] of the adsorbed metals, which allows the regeneration of biosorbent material. Biosorption consists of several mechanisms such as,