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ENHANCED REMOVAL OF Cr(III) BY NaOH-MODIFIED SCRAPED COCONUT WASTE

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Increase in human population and industrial development cause severe damage to the environment. Industrial effluents release different types of pollutants, such as heavy metals, anions, dyes and pesticides, to natural water bodies, resulting in water pollution. Among these, heavy metals are considered to be the most hazardous. Consequently, removal of heavy metals from industrial effluents using low-cost biosorbents is becoming popular. However, improvement of efficiency of removal of pollutants by biosorbents has become a challenge. This study is an attempt made to enhance the removal of Cr(III) from synthetic waste-water by NaOH-treated scraped coconut waste (NSCW), which is readily available in tropical countries, such as Sri Lanka, at no cost. The optimum values of experimental parameters determined for most efficient biosorption of Cr(III) by NSCW are: 0.70 g NSCW mass; 5.0 initial solution pH; 90 min shaking time and 30 min settling time. Further, NaOH-modified SCW provides the highest extent of Cr(III) removal when the concentration of NaOH solution is 0.10 M, which is considered to be the optimum concentration of the modifying agent. Under the optimized conditions, NaOH treatment provides Cr(III) removal, enhanced from 53.6% in the absence of any modification to 92.9% when SCW is treated with 0.10 M NaOH solution. On the other hand, acid treatment leads to decreased extent of removal ruling out the possibility of ion exchange. It is thus proposed that the complexation is the most probable mechanism of Cr(III) removal which is enhanced by conversion of ester groups and carboxylic acid groups to negatively charged species by NaOH treatment promoting complexation with Cr(III). Isotherm studies show that Cr(III) on NSCW obeys the Langmuir adsorption isotherm better than the Freundlich adsorption isotherm, leading to adsorption capacity of 14.28 mg g^{-1}.

Keywords: Adsorption isotherms, Biosorbents, Parameter optimization, Scraped coconut waste