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REMOVAL OF Cu2+ AND Zn2+ USING UNMODIFIED COCONUT COIR DUST

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Copper and zinc are considered as essential micronutrients for living organisms, although these two metal ions are hazardous at high concentrations. Consequently, these metals and their compounds present in wastewater should be removed prior to its release to the environment. Adsorption is an effective method to remove metal ions in wastewater, especially when present at low concentrations. The widely used adsorbent, activated carbon, requires high production cost, promoting low-cost masses, such as plant materials, animal waste and naturally occurring minerals for metal removal. In the present study, one such low-cost adsorbent, coir dust, is studied to check the employability to remove copper and zinc ions from industrial waste water. Batch experiments were used in the removal of selected two metal ions. Fourier transform infrared spectroscopy reveals that O-H bonds, C-H stretching of alkanes and C=O stretching of carboxylic groups are present in the constituents of coir dust. The specific surface area of coir dust particles determined using the Methylene Blue Test is 285 m2 g-1 with the point of zero charge at pH = 5.0, as determined by surface titrations. This reveals that coir dust is a good adsorbent. Optimization of experimental parameters using synthetic Cu2+ and Zn2+ solutions by varying one parameter at a time reveals that 1.0 h shaking time and 10 min settling time are optimum for both metal ions, and pH 7 and 8 were the optimum pH values for Cu2+ and Zn2+, respectively. Adsorption equilibrium experiments performed over a concentration range from 10 ppm to 2000 ppm fulfill the requirements of the Langmuir model which is a monolayer adsorption, with adsorption capacities of 34.6 mg g-1 and 27.0 mg g-1 respectively, for Cu2+ and Zn2+. Further, the method of initial rates applied for investigation of the interaction of Cu2+ and Zn2+ with coir dust indicates the validity of the pseudo second order kinetic model. When considering above facts, use of coir dust is an effective biosorbent to remove Cu2+ and Zn2+ without any prior treatment. Further experiments are needed to evaluate the employability of coir dust in large scale waste water treatment.