Zinc abatement from simulated and industrial wastewaters using sugarcane biomass

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Abstract

The use of heavy metals and their compounds in industrial applications has resulted in their occurrence in various environmental media including water bodies. Conventional methods of heavy metal removal from wastewaters are very expensive, when available, especially in developing countries. This study therefore assessed the potential of sugarcane biomass to remove zinc from standard solutions and industrial (paint and textile) wastewaters. Parameters studied include contact time, biomass weight, metal concentration, pH, agitation, temperature and particle size. Physico-chemical characteristics of biomass were also studied. Adsorption of zinc increased with increases in contact time, biomass weight, pH and agitation speed, while adsorption decreased with increasing particle size and for temperatures above 50^{o}C. Sugarcane biomass was responsible for over 90% adsorption of Zn^{2+} in both effluents. Under conditions of agitation, 100% adsorption was achieved. Percentage ash, particle density, cation exchange capacity (CEC) and porosity are important physico-chemical properties which influenced Zn^{2+} adsorption. Percentage ash and CEC are positively correlated to percentage adsorption while particle density and porosity are negatively correlated. Percentage desorption was over 90 for both effluents. Sugarcane biomass is therefore a potential alternative to expensive synthetic resins. Its biodegradability makes disposal environmentally friendly. However, there is the need to further study the biomass in flow-through systems for industrial applicability.

Keywords: Zinc, sugarcane biomass, wastewaters, remediation.