



## An evaluation of cadmium sorption potential of waste aluminium dross

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### ABSTRACT

The removal of Cd(II) from aqueous solution onto aluminium dross surface was investigated. The influence of pH, contact time, initial metal ion concentration and temperature on the effectiveness of the removal process was studied. The variation of adsorption efficiency with pH indicates that the aluminium dross has residual negative charge on the surface. At low pH, H<sup>+</sup> ion gets adsorbed preferentially than Cd(II) ion but at higher pH, Cd(II) ion gets adsorbed in larger numbers. It has been further observed that the adsorption efficiency increases with temperature indicating an increase in kinetic energy of the solute ions or decrease in boundary layer resistance to mass transfer. Kinetic study indicated that in the present work the adsorption process follows mainly pseudo-first-order rate model. The low activation energy (18.3 kJ mol<sup>-1</sup>) reveals that the process is spontaneous and physical in nature. The value of  $\Delta G^\circ$  is negative which further decreases with temperature indicating spontaneity of the adsorption process. The positive value of  $\Delta H^\circ$  indicates that the process is endothermic. The present study revealed that waste aluminium dross can be a potential sorption material for cadmium in an aqueous system under conditions of pH (4–9), temperature of about 42°C and reaction time of 2 h.

*Keywords:* Cadmium; Sorption; Aluminium dross; Kinetics; Thermodynamics

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