



## Adsorption of nickel from aqueous solution by the use of low-cost adsorbents

Yasser Hannachi<sup>a,b\*</sup>, N.A. Shapovalov<sup>a</sup>, Aymen Hannachi<sup>b</sup>

<sup>a</sup>Belgorod State Technological University, Department of Colloid Chemistry, 308012 Belgorod, Russia

<sup>b</sup>El Manar Preparatory Institute for Engineering Studies, Department of physic Chemistry 2092 El Manar II, Tunisia  
Tel. +216 (7) 3500274; Fax +216 (7) 3500278; email: yasser\_102@yahoo.fr

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### ABSTRACT

The removal of Ni(II) from aqueous solution by different adsorbents was investigated. Calcined phosphate, red mud, clarified sludge (a steel industry waste material) were used for the adsorption studies. The influence of pH, contact time, initial metal concentration, adsorbent nature and concentration on the selectivity and sensitivity of the removal process was investigated. The adsorption process was found to follow a first-order rate mechanism and rate constant was evaluated at 30°C. Langmuir and Freundlich adsorption isotherms fit well in the experimental data and their constants were evaluated. The thermodynamic equilibrium constant and the Gibbs free energy were calculated for each system. The adsorption capacity ( $q_{\max}$ ) calculated from Langmuir isotherm and the values of Gibbs free energy obtained showed that Calcined phosphate has the largest capacity and affinity for the removal of Ni(II) compared to the other adsorbents used in the study.

*Keywords:* Calcined phosphate; Red mud; Clarified sludge; Langmuir isotherm; Freundlich isotherm; Gibbs free energy; First-order rate mechanism

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\* Corresponding author.