



Removal of Ponceau S by adsorption onto alumino-phosphate: efficiency and modeling

Abdenacer Flilissa^{a,*}, Widad Sebaihi^a, Venkataraman Sivasankar^b, Mokhtar Boutahala^c, André Darchen^d

^aLaboratoire des maladies Cardiovasculaire, Génétiques et Nutritionnelles, Département de Pharmacie, Faculté de Médecine, Université Ferhat Abbas, Sétif-1, 19000, Algeria, Tel. +213 777156810; email: konicakp34@yahoo.fr

^bDepartment of Civil Engineering, School of Engineering, Nagasaki University, Nagasaki-Daigaku, 1-14 Bunkyo-machi, Nagasaki 852 8521, Japan, email: sivshri.20@gmail.com

^cLaboratoire de Génie des Procédés Chimiques, Département de Génie des Procédés, Faculté de Technologie, Université Ferhat Abbas, Sétif-1, 19000, Algeria, email: mboutahala@yahoo.fr

^dUMR CNRS 6226 Institut des Sciences Chimiques de Rennes, ENSCR, 11 Allée de Beaulieu, CS 50837, 35708, Rennes Cedex 7, France, email: Andre.Darchen@ensc-rennes.fr

Received 6 March 2016; Accepted 13 June 2016

ABSTRACT

Ponceau S (PS) is an azo dye widely used for versatile applications in foods and biochemistry; nevertheless, it is suspected to be toxic and carcinogenic. In this research article, the removal of PS from aqueous solution was investigated by adsorption onto alumino-phosphate (AlPO₄). This adsorbent has been synthesized by precipitation from solution of aluminum salt. It was an amorphous solid with a specific area and p*H*_{zpc} of 100 m²/g and 4.6, respectively. The efficiency of PS sorption as a function of p*H*, initial PS concentration, AlPO₄ dose and temperature was studied. The present PS sorption dynamics followed the pseudo-first-order model and the calculated sorption capacity was in good agreement with the experimental values. The compliance of isotherm models such as Langmuir, Freundlich and Sips was also verified. Among the isotherm models, Sips was deemed to be the better fit than others. PS sorption as a function of temperature explicates an exothermic nature of sorption which decreased from 9.12 mg g⁻¹ (300 K) to 6.08 mg g⁻¹ (315 K). The adsorbed PS on AlPO₄ was easily desorbed by washing at p*H* 7 and the adsorption equilibrium was established in the first 8 min. The PS laden adsorbent was also regenerated by heating at 600°C for 30 min and the regenerated AlPO₄ was attempted for its continual utilization for the adsorption of PS successfully.

Keywords: Ponceau S; AlPO₄; Adsorption; Desorption; Regeneration

* Corresponding author.