Adsorption of crystal violet onto amino silica: optimization, equilibrium, and kinetic studies

Haiyang Yang, Dapeng Zhou, Zhixian Chang, Ling Zhang*

Institute of Environmental and Analytical Sciences, College of Chemistry and Chemical Engineering, Henan University, Kaifeng, Henan 475004, PR China
Tel./Fax: +86 378 3881589; email: zhangling@henu.edu.cn

Received 9 January 2013; Accepted 24 May 2013

ABSTRACT

Adsorption of crystal violet (CV) onto amino silica (AS) was investigated as a function of parameters including aqueous pH, temperature, AS dose, contact time, agitation speed, and initial CV concentration. And the optimum conditions obtained from response surface methodology (RSM) were temperature 33°C, AS dosage 0.35 g, contact time 64 min, and agitation speed 230 rpm. The adsorption equilibrium using Langmuir and Freundlich models indicated that the process followed Langmuir isotherm and the maximum adsorption capacity reached 40 mg g\(^{-1}\). After both pseudo-first-order and pseudo-second-order kinetic models were applied to the experimental data, pseudo-second-order model was found describing the adsorption process very well.

Keywords: Adsorption; Amino silica; Crystal violet; Response surface methodology

*Corresponding author.

1944-3994/1944-3986 © 2013 Balaban Desalination Publications. All rights reserved.