Journal Pre-proof

Cerium oxide nanoparticles application for rapid adsorptive removal of tetracycline in water

Iis Nurhasanah, Kadarisman, Vincensius Gunawan, Heri Sutanto

PII: S2213-3437(19)30736-5

DOI: https://doi.org/10.1016/j.jece.2019.103613

Reference: JECE 103613

To appear in: *Journal of Environmental Chemical Engineering*

Received Date: 13 September 2019

Revised Date: 28 November 2019

Accepted Date: 15 December 2019

Please cite this article as: Nurhasanah I, Kadarisman, Gunawan V, Sutanto H, Cerium oxide nanoparticles application for rapid adsorptive removal of tetracycline in water, *Journal of Environmental Chemical Engineering* (2019), doi: https://doi.org/10.1016/j.jece.2019.103613

Cerium oxide nanoparticles application for rapid adsorptive removal of tetracycline in water

Iis Nurhasanah, Kadarisman, Vincensius Gunawan, and Heri Sutanto

Department of Physics, Faculty of Science and Mathematics, Diponegoro University

Jalan Prof. Soedarto, S.H., Tembalang, Semarang, Central Java, Indonesia 50275

Corresponding author e-mail: iisphysics@gmail.com

Abstract

This study investigates the potential of CeO_2 nanoparticle as an adsorbent to remove tetracycline (TC) in water. CeO_2 nanoparticle was synthesized using precipitation method in water/alcohol mixed solvents. As-synthesized sample was characterized using x-ray diffractometer, scanning electron microscope, and Fourier transform infrared spectroscopy. The adsorption isotherm experiment was conducted in liquid phase by varying the contact time and the temperature at initial TC concentration of 25 – 125 mg/L. The result showed that CeO_2 has a cubic structure with crystallite size of 10.86 nm and is composed by aggregate particles. The equilibrium adsorption is reached after a contact time of 60 min that yield the removal efficiency of 80-97% and adsorption capacity of 58.03 mg/g. The adsorption kinetic analysis indicated that the adsorption process could be described by a pseudo second order model. The thermodynamic parameters confirmed that TC adsorption onto CeO_2 nanoparticle was exothermic and spontaneous. The high removal efficiency and short time adsorption equilibrium suggest that CeO_2 nanoparticle can be used as an antibiotic adsorbent for water treatment.

Keywords: CeO_2, adsorption, tetracycline, water treatment