Photocatalyst treatment for lead(II) using titanium oxide nanoparticles embedded in PVA-alginate beads

Ani Idris a,*, Zohreh Majidnia a, Khairol Sozana bt. Nor Kamarudin b

aFaculty of Chemical Engineering, Department of Bioprocess Engineering, c/o Institute of Bioproduct Development, Universiti Teknologi Malaysia, Skudai 81310, Johor, Malaysia, Tel. +60 07 5535603; Fax: +60 07 5581463; email: ani@cheme.utm.my (A. Idris), Tel. +60 17753 793; email: zmajidnia@yahoo.com (Z. Majidnia)
bFaculty of Chemical Engineering, Department of Gas Engineering, Universiti Teknologi Malaysia, Skudai 81310, Johor, Malaysia, Tel. +60 75535482; email: sozana@fkkksa.utm.my

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ABSTRACT

In this paper, titanium oxide nanoparticles were produced using the hydrothermal method and embedded in PVA-alginate beads to remove Pb(II) ions from aqueous solutions. The kinetics of the photocatalyst process was elucidated by varying operating parameters such as pH (3, 7 and 10) and initial Pb(II) concentrations (25, 50, 100 and 200 mg/L). The findings revealed that 99.1% of the Pb(II) was removed within 150 min and maximum removal occurred in initial concentration of 25 mg/L at pH 7. The titania PVA-alginate beads can be readily isolated from the aqueous solutions after the photocatalytic process and reused for at least seven times without significant loss in their initial properties. In addition, the reduction of Pb(II) from wastewater using titania PVA-alginate beads fitted the Langmuir–Hinshelwood kinetic model with a correlation coefficient ($R^2$) of 0.9931.

Keywords: Photocatalysts; TiO$_2$ nanoparticles; PVA–alginate; Pb(II) solution; Wastewater treatment

*Corresponding author.

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