

Photodegradation of methylene blue dye using bentonite as a catalyst

Fawzi Banat, Sameer Al-Asheh*, Rwaida Zomaout, Belal Qtaishat, Taghreed Alateat, Salam Almayta

Department of Chemical Engineering, Jordan University of Science and Technology, PO Box 3030, Irbid 22110 Jordan
Tel. +962 2 720 1000, ext. 22410; Fax: +962 2 720 1074; email: alashah@just.edu.jo

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ABSTRACT

This study involves removal of methylene blue (MB) dye using the photodegradation process. Raw and activated bentonite has been considered as a photo-catalyst. Generally, complete removal of MB by bentonite alone or UV-radiation alone could not be achieved, as demonstrated in this study. However, MB could be successfully decolorized and degraded when using the UV and bentonite combination. Use of hydroxyl-Fe-pillared bentonite has been investigated and found to result in a complete phot-degradation of MB. The effects of different operating parameters on the MB degradation using this process have been investigated. These include initial MB concentration, bentonite concentration, pH of the slurry system, presence of electrolyte, addition of ferric sulphate and effect settling curve. Also, the rate degradation processes was investigated at these different conditions and parameters; and to certain extent were reasonably fitted to a pseudo-first-order kinetic model. Increasing initial concentration of MB, at a constant concentration of bentonite or hydroxyl-Fe-pillared bentonite (H-Fe-P-B), increases the time of degradation. The time for decolorization MB when using UV-hydroxyl-Fe-pillared bentonite slurry system is lower than that when using the UV-bentonite slurry system. The optimum pH for the removal of MB using UV-bentonite slurry process is 4.0. The presence of ferric sulphate salt reduces the photodegradation of MB.

Keywords: Methylene blue; Bentonite; Photodegradation; Pillaring

* Corresponding author.