

Phenol photodegradation process assisted with Wells–Dawson heteropolyacids

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Abstract: This work aims to investigate the catalytic properties of the heteropolyacids (HPAs) within photocatalytic process. Photocatalytic degradation of phenol in aqueous solution was performed using Wells–Dawson HPAs as catalysts under UV-illuminated condition at 254 nm. The effects of various parameters such as, concentration of catalyst, initial pH, and initial phenol concentration on the performance of photocatalytic process have been investigated to obtain the efficient and durable catalysts and determine the better reaction conditions. The kinetics and the efficiency of phenol degradation were determined by various analytical techniques, such as HPLC and TOC. The results show that the photocatalytic degradation efficiency increases with decreasing pH and the optimum pH is 2 for both catalysts. The photodegradation follows pseudo-first-order kinetics with rate constants $k = 8.56 \times 10^{-22}$ and $9.94 \times 10^{-22} \text{ min}^{-1}$ for iron- and vanadium-substituted HPAs, respectively.

Keywords : Well-Dawson HPA, Homogeneous catalysis, Phenol photodegradation, UV irradiation