Photocatalytic removal of Cr(VI) with illuminated TiO$_2$

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ABSTRACT

The effect of dissolved oxygen on the photocatalytic reduction of Cr(VI) with illuminated TiO$_2$ was studied in this work with variation of the solution pH, contact time, and initial Cr(VI) concentration. Oxygen or nitrogen gas was used as a purging gas. Overall, the removal efficiency of Cr(VI) decreased as the solution pH increased. The removal of Cr(VI) by UV/TiO$_2$ increased by decreasing the solution pH because of the increased potential difference between the conduction band of TiO$_2$ and Cr(VI)/Cr(III) as well as the anionic-type adsorption of Cr(VI) onto the TiO$_2$ surface. The removal efficiency of Cr(VI) increased in purging of nitrogen gas compared to that of oxygen gas because of less competition between dissolved oxygen and Cr(VI) in the reaction with the electron in the conduction band of TiO$_2$. The reduction pattern was better described by the first-order kinetic model.

Keywords: Dissolved oxygen; Photocatalysis; Cr(VI); TiO$_2$