ABSTRACT

The objective of this research is to study the photoreduction behaviors of Cr(VI) ions in aqueous solutions by non-modified and modified photocatalytic processes under various operational factors, such as solution pH values, TiO2 dosages, types and dosages of organic compound (so-called h+-scavenger) with modified TiO2 which were doped with different types and dosages of metals to investigate the removal efficiencies of Cr(VI) in order to determine the optimum conditions of the photoreduction reaction.

Experimental results showed that the removal rate of Cr(VI) increased with decreasing solution pH values and with increasing dosages of organic compounds (methanol, ethanol, and isopropane) indicating that the recombination rate of electrons and h+ can be retarded in the reaction systems by the addition of the h+-scavenger, thus the reaction rate of Cr(VI) can be raised. The chemical reaction rate equation of Cr(VI) were established by pseudo-first order kinetic and the kinetic order of TiO2 dosage was found to be almost the same by non-modified and modified UV/TiO2 processes. Comparing the experimental results within modified TiO2 photoreduction systems, the removal rate of Cr(VI) by the UV/Ag-doped TiO2 process was larger than that by to the UV/Cu-doped TiO2 process possibly due to the electron transferring ability of Ag is superior to that of Cu. However, the photoreduction rates of Cr(VI) by the non-modified UV/TiO2 process (Digussa P25) were less than those by modified UV/TiO2 processes possibly because of the competition between the effects of electron transferring and deactivation of deposition of metals onto the surface of TiO2.

Keywords: Cr(VI); UV/TiO2; h+-scavenger; photoreduction; modified photocatalysis