

The degradation of humic substance using continuous photocatalysis systems

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Abstract:

Photocatalytic oxidation is an emerging technology in water and wastewater treatment. Photocatalysis often leads to complete degradation of organic pollutants without the need for chemicals. This study investigated the degradation of humic substances in water using photocatalysis systems coupled with physio-chemical processes such as adsorption and/or flocculation. Dissolved Organic Carbon (DOC) removal of PAC-TiO₂ was improved by a factor of two to three times compared with TiO₂ alone. Solid Phase Micro Extraction (SPME)/Gas Chromatograph (GC) flame ionisation detector (FID) was used to investigate intermediates of photocatalytic oxidation in a batch reactor with TiO₂ alone and with powder activated carbon (PAC) with TiO₂. GC peaks showed that PAC-TiO₂ adsorbed some by-products which were photo-resistant and prevented the reverse reaction that occurred when TiO₂ was used alone. The two other types of photocatalytic reactors used were the continuous photocatalytic reactor and recirculated photocatalytic reactor. The results show that the recirculated reactor had the highest efficiency in removing organic matter in a short photo-oxidation (detention) time of less than 10min. The use of PAC-TiO₂ in recirculated continuous reactor resulted in 80% removal of organic matter even when it was operated for a short detention time and allowed the use of a smaller dose of TiO₂.

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