

Removal of cationic and anionic dyes by immobilised titanium dioxide loaded activated carbon

ABSTRACT

Combination of adsorption and photodegradation processes induces strong beneficial effects in dye removals. Adding high adsorption capacity activated carbon to photoactive titanium dioxide is an attractive solution due to their potential in removing dyes of diverse chemical characteristics. Recently, immobilisation has been an acceptable approach to overcome the drawbacks encountered with powder suspensions. The present study involves the removals of Victoria Blue R (VBR), a cationic dye and Indigo Carmine (IC), an anionic using approximately one gram of immobilised titanium dioxide (TiO₂), activated carbon (AC) and mixture titanium dioxide/activated carbon (TiO₂/AC) from 200 mL solution at the concentration of 20 ppm under UV illumination for 4 hours. Comparisons were made in terms of their removal efficiency by applying first-order kinetics model. Immobilised TiO₂ showed total removal of IC in 40 minutes whereas only 44% of VBR was removed in 2 hours. On the other hand, in the case of immobilised AC, about 87% of VBR and 6% of IC were removed in 2 hours. The results obtained using immobilised TiO₂/AC proved the prominence of this immobilised sample in dealing with VBR and IC by achieving 95% and 62% removal respectively in 2 hours.

Keyword: Adsorption; Photodegradation; Activated carbon; Titanium dioxide; Cationic anionic dyes