

PHOTOCATALYTIC REDUCTION OF HEXAVALENT CHROMIUM IN AQUEOUS SOLUTIONS BY TiO₂/PAN NANOFIBERS

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ABSTRACT

This study was focused on the fabrication and application of titanium dioxide (TiO₂)/polyacrylonitrile (PAN) nanofibers. TiO₂/PAN nanofibers were prepared by the electrospinning process from the mixture of titanium isopropoxide (TIIP), PAN, acetone and dimethyl sulfoxide (DMSO). The catalytic performance of the PAN/TiO₂ nanofibers on the reductive degradation of Cr(VI) under various condition was investigated. Solution pHs, light source and presence humic acid were studied as the main factors for the reaction. The photocatalytic reduction rates of Cr(VI) were significantly higher at the acidic condition than those at alkaline condition. The TiO₂/PAN nanofibers could be activated by the visible light. At acid and neutral condition, the removal efficiency is nearly 100% under both UV and visible light exposure, which partially confirm that TiO₂ anatase crystals had been doped to some degree with carbon or nitrogen from PAN in the annealing process. The presence of humic acid promoted the photocatalytic reduction of Cr(VI) by electrons. This trend could be result from the increased photocatalytic efficiency due to the reduced recombination between positive holes in the valence band and the electrons in the conduction band of the TiO₂.