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A photocatalyst based on PTh/[Fe(CN)$_3$(NO)(bpy)] 4H$_2$O nanocomposite fibers for MO dye degradation

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Dye effluents from textile industries are becoming a serious environmental problem because of their unacceptable color, high chemical oxygen demand and resistance to chemical, photochemical and biological degradation [1].

In relation to this, a photocatalyst based on PTh/[Fe(CN)$_3$(NO)(bpy)]4H$_2$O has been synthesized by chemical polymerization. Fibrous structure of nanocomposite have been confirmed from TEM (Figure 1).

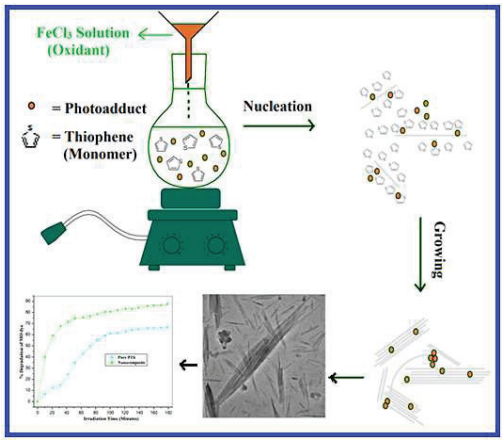

Figure 1: This shows the schematic representation of the synthesis of nanocomposite fibers with enhanced photocatalytic activity

Higher photocatalytic activity of the present material for methyl orange (MO) dye have been observed than many other two component systems as reported in literature. This has been attributed to the presence of synergistic effect between PTh and [Fe(CN)$_3$(NO)(bpy)]4H$_2$O particles which is believed to play an essential role in affecting the photoreactivity. From BET, surface area of nanocomposite has been found to be 18.9 m^2/g. The main contributing factor to the enhanced photocatalytic activity of nanocomposite fibers has been attributed to the interface contact between PTh and photoadduct particles, as is evidenced by PL measurements. Also, the degradation mechanism of the photocatalytic process has been proposed and the active species involved to cause degradation are confirmed by using different scavengers (Figure 2). Kinetic study revealed degradation process to follow second order kinetics with an observed rate constant of 7 × 10^{-4} Lmol^{-1}s^{-1}.

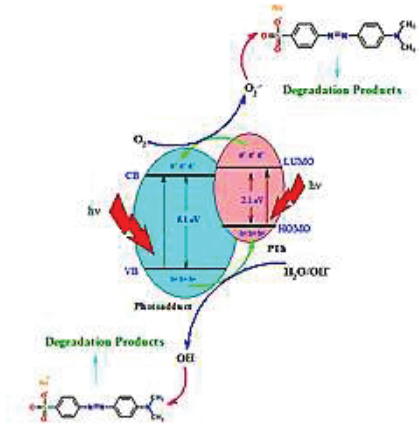

Figure 2: The proposed mechanism for the photo-degradation of MO dye using the synthesized photocatalyst (nanocomposite fibers)

Reference

1. R. Lu, L. Yuanzhi, H. Jingtao, Z. Xiujian, P. Chunzu, *ACS Appl. Mater. Interfaces,* 2014, 6, 1608-1615.