Contribution ID: **212** Type: **Oral Presentation**

Enhanced photocatalytic degradation of methyl violet on TiO2/N-MWCNTs

Tuesday, 26 June 2018 11:20 (20 minutes)

Textile industries are amongst the top environs of water polluters. They release complex organic pollutants (such as organic dyes) that are resistant to conventional water purification methods. Lately, TiO2-based photocatalytic degradation method has been successfully used to ravage the organic dye pollutants in aqueous medium at a low cost. However, the efficiency and turnover number of TiO2 is limited due to its low surface area, sintering, and the electron-hole recombination. Thus, multiwalled carbon nanotubes (MWCNTs) can be used to enhance the photocatalytic activity of TiO2 by increasing the catalyst surface area and also acting as photo-generated electron capturers. Moreover, the MWCNTs can be modified with nitrogen dopants to create more defects on the carbon lattice and a net positive charge to strengthen the TiO2-C interaction. We herein report on the competence of CVD-synthesized nitrogen doped MWCNTs (N-MWCNTs) in the enhancement of TiO2 photocatalytic activity for the degradation of methyl violet. Our results showed that N-MWCNTs supported TiO2 photocatalyst exhibit a large surface area, good TiO2-C interaction, and a reduction in the electron-hole recombination. Consequently, the photocatalytic activity of raw TiO2 was drastically increased after the inclusion of N-MWCNTs. Furthermore, the N-MWCNTs showed a great potential of improving the photocatalytic stability of TiO2 and its reusability.

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Session Classification: Applied Physics

Track Classification: Track F - Applied Physics