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Using one-step facile and solvent-free mechanochemical process to synthesize photoactive Fe_2O_3-TiO_2 for treating industrial wastewater

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ABSTRACT

In this present study, Fe_2O_3-TiO_2 photocatalyst was synthesized and used to degrade real industrial wastewater, namely pulp and paper mill effluent (PPME). Fe_2O_3-TiO_2 was synthesized via ball milling at ambient conditions without incorporating any solvent. Comprehensive characterization studies and photocatalytic evaluations of the synthesized Fe_2O_3-TiO_2 were conducted in this study. It was verified that Fe_2O_3-TiO_2 possessed crystalline structures of γ-Fe_2O_3, anatase and rutile TiO_2. Also, a good dispersion of Fe and O elements within the TiO_2 framework was attained. A detection of Fe-O-Ti bond elucidated a substitution of Ti^{4+} by Fe^{3+} in the TiO_2 lattice sites through mechanical milling, which ultimately enhanced the photocatalytic