# TiO2 nanowires doped with hæmatite nanoparticles for enhanced photocatalytic degradation of methyl orange.



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Hæmatite nanoparticles with a truncated dodecahedron crystal shape were synthesized by hydrothermal method at 180 °C and self-generated pressure. FeCl3.7H2O, acetic acid and NaOH were employed as precursors. This crystal shape has an improved performance in the photo-Fenton reaction due to terminal Fe exposure. The nanoparticles were previously characterized and further added to a sol-gel mixture to prepare the TiO2 nanowires with a coaxial setup for the electrospinning. The composite nanowires were characterized through HR-TEM, UV-Vis DRS, TGA and XRD and tested in the photodegradation of methyl orange with the addition of H2O2. Rutile and anatase and hematite were identified in the diffraction patterns. By TEM it was possible to confirm a good nanoparticle dispersion along the nanowires. The nanowires showed an improved absorption in the visible spectrum compared to that of pure TiO2. The discoloration yield was 85% after 2 h of reaction. This result is comparable to the one obtained with a suspension of hæmatite nanoparticles alone. It should be noted that the colourant discoloration under UV activated H2O2 reached only 40 %. In conclusion, these composite nanowires have two attractive features with regard to water treatment technologies, namely the advantage of easy recovery and the possibility to carry out the reaction without H2O2, due to the enhanced semiconductor capacity of TiO2.

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**Track:** SED: Removal of water and air pollution by semiconductors