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HUMIC ACID REMOVAL FROM WATER BY SORPTION AND PHOTOCATALYSIS UNDER VIS IRRADIATION USING Fe_2O_3/SILICA NANOCOMPOSITE

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Abstract

Hematite/silica nanocomposite (α-Fe_2O_3/SiO_2) was synthesized by sol-gel method at room temperature followed by thermal treatment through calcination at the temperature of 500° C selected based on thermo gravimetric analysis (TGA) and differential thermal analysis (DTA) results. The crystalline phases of α-Fe_2O_3 and SiO_2 were characterized by the correlation of X-ray diffraction (XRD) and Fourier transform infrared spectroscopy (FTIR) results. The composite average particle size values ranged between 10 and 22 nm were estimated through XRD and transmission electron microscopy (TEM). The composite exhibited a high capacity to remove humic acids (HA) from water, through the sorption and VIS irradiation-assisted photocatalysis processes. The heterogeneous structure of the composite was found by corroborating Brunauer–Emmett–Teller (BET) results with the HA sorption physical mechanism determined by Dubinin-Radushkevich isotherm model. A synergic effect regarding visible irradiation-assisted photocatalysis process using α-Fe_2O_3/SiO_2 was manifested for HA removal by comparison with the sorption and photolysis under VIS irradiation, which suggested a great potential for developing of a new nature-based inspired unitary processes for advanced treatment water for drinking purpose.

Key words: hematite/silica, humic acids, nanocomposite, water treatment

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