Characterization and photocatalytic activity of Barkin-Ladi ilmenite ore under visible light irradiation

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Abstract

Photocatalysis is an advanced oxidation process that can be carried out at room temperature under atmospheric pressure using atmospheric oxygen as the oxidant and the sun as the source of energy. This work focuses on the composition and photocatalytic activity of the raw and calcined samples of ilmenite ore obtained from Barkin-Ladi, Plateau State, Nigeria, using methyl orange as the model substrate under visible light irradiation. The ilmenite ore was characterized using X-ray fluorescence (XRF) spectroscopy and X-ray diffractometry (XRD). Barkin ladi ilmenite ore is basically composed of the rutile phase of TiO_2 and ilmenite ($FeTiO_3$) and small amount of gangue minerals. Upon calcination at 800 °C, $FeTiO_3$ of the ore converted into a mixture of Fe_2O_3 and TiO2. The photocatalytic activity of the ilmenite ore did not change much after calcination at 500 - 700 °C. The ilmenite ore calcined at 800 °C exhibited the lowest photocatalytic activity. Significant improvement of the photocatalytic degradation of methyl orange was observed upon addition of H_2O_2 into the system.

Keywords: Photocatalyst, Ilmenite ore, Calcination, Methyl orange, Degradation

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