ABSTRACT

SYNTHESIS AND CHARACTERIZATION OF Ni_{0,5}Cu_{0,5}Fe₂O₄ NANOCATALYST AND ACTIVITY TEST FOR METHANYL YELLOW PHOTODEGRADATION

By

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The main purpose of this study is to make Ni_{0.5}Cu_{0.5}Fe₂O₄ nanocatalysts through sol-gel method using pectin an emulsifying agent. The catalyst was subsequently calcined at 600 and 800 °C for three hours, and then tested for photodegradation of methanyl yellow. Photodegradation experiments was conducted using UV lamp and sunlight, and the degradation performance was evaluated by measuring the absorbance at 425 nm using UV-Vis spectrometer. The experimental results demonstrated that using sunlight, the concentration of the methanyl yellow was reduced around 57 and 68% using the catalyst calcined at 600 and 800 °C, respectively, and around 38 and 65% using UV lamp. Characterization using gravimetric method showed that the catalyst calcined at 600 °C has the acidity of 6.28 mmol pyridine/g catalyst and that calcined at 800 °C has acidity of 6.04 mmol pyridine/g catalyst, with Lewis acid as the main acid site as seen by FTIR. Characterization with XRD technique indicates the presence of NiFe₂O₄, CuFe₂O₄, and NiO phase, confirming the formation of Ni_{0.5}Cu_{0.5}Fe₂O₄. Using Scherrer equation it was obtained that the average particle size of the catalyst calsined at 600 °C is 11.35 nm and 33.06 nm for the catalyst calcined at 800 °C. Surface analysis of the catalyst calcined at 600 °C using SEM showed the existence of particles with different sizes and shapes, homogeneously distributed on the surface. EDS analysis revealed the existence of elements includes 8.67% Ni, 13.11% Cu, 33.86% Fe, and 33% O, which is in accordance with the raw materials used.

Keyword: Nanocatalyst, Pectin, Photodegradation, Metanil yellow