

ABSTRACT

Cooking oil is a staple commodity in Indonesia, most of which comes from vegetable sources. However, repeated use causes chemical degradation that is harmful to health and pollutes the environment when disposed of as waste. The use of used cooking oil as a raw material for biodiesel is a solution that is in line with the concept of renewable energy because it can reduce waste while producing more environmentally friendly fuel. This study aims to synthesize Fe_3O_4/H -Zeolite composites and evaluate the performance of Fe_3O_4/H -Zeolite catalysts in the transesterification reaction of used cooking oil into biodiesel. Fe_3O_4/H -Zeolite composites were synthesized through the activation of natural zeolite and coprecipitation of Fe_3O_4 , then characterized using XRD and FTIR. The transesterification reaction was carried out using methanol at a temperature of $65^\circ C$ for 3 hours, with a molar ratio of oil to methanol of 1:12, and the use of a catalyst of 1% of the weight of used cooking oil. The transesterification results were analyzed using GC-MS. The GC-MS analysis results showed that the transesterification process with the highest methyl ester content was on the Fe_3O_4/H -Zeolite catalyst with a 2:1 ratio exceeded 97.42%, followed by a 1:1 ratio of 90.85%, while the 1:2 ratio and pure H-Zeolite showed much lower values of 12.06% and 10.41%, respectively. The volume of methyl ester obtained in the Fe_3O_4/H -Zeolite catalyst with a 2:1 ratio was 28 mL, for Fe_3O_4/H -Zeolite with a 1:1 ratio it was 27.3 mL, while Fe_3O_4/H -Zeolite with a 1:2 ratio and pure H-Zeolite showed values of 2.9 mL and 2.2 mL

Keywords: *Fe_3O_4/H -Zeolite composite, transesterification catalyst, biodiesel*