ABSTRACK

The use of biofuel as an environmentally friendly alternative energy is a solution to meet the needs and reduce dependence on fossil fuels. One of the potential raw materials for biofuel is used cooking oil which can be converted through a hydrocracking process with the help of heterogeneous catalysts. This study aims to determine the effect of the ratio of Pluronic P123 and cetyltrimethylammonium bromide (CTAB) as a template in the synthesis of mesoporous silica as a carrier for Ni-Cu catalysts, as well as to determine its characteristics and selectivity in the hydrocracking reaction of used cooking oil into biofuel. Mesoporous silica was synthesized with three variations of the molar ratio of the P123/CTAB template (1.6:1; 1:1.6; and 1:1). The catalyst was synthesized using the impregnation method, then characterized by acidity, FTIR, XRD, and GSA tests. The application of the catalyst was tested in the hydrocracking process and the products were analyzed using GC-MS. The results showed that the catalyst with a high ratio of P123 to CTAB had the highest acidity of 9.56 mmol g^{-1}, a surface area of 466.32 m^2 g^{-1}, a pore volume of 0.45 cm^3 g^{-1}, an average pore diameter of 5.72 nm and a uniform pore distribution with a large number. The highest selectivity of biofuel products was also obtained at 75.9% with a dominant fraction of C_{16}–C_{18}. This study proves that a large ratio of P123 to CTAB can increase the surface area, pore volume, and total biofuel production yield which indicates an increase in catalytic activity.

Keywords: Mesoporous silica, P123, CTAB, Ni-Cu catalyst, hydrocracking, waste cooking oil, biofuel, selectivity, surface area.