

Monitoring microwave dielectric properties during transesterification reaction for palm biodiesel production

ABSTRACT

Microwave energy offers a fast method to produce biodiesel with advantages of enhancing the reaction rate and improving the reaction separation. The dielectric properties at frequency range from 0.2 GHz to 20 GHz of a mixture during transesterification reaction which are used for producing palm biodiesel were presented. The monitoring was done by placing a dielectric probe at the upper level and lower level of the mixture to measure the dielectric properties during the formation of biodiesel and glycerin respectively. In the transesterification reaction, the mixture consisting of vegetable oil, methanol and sodium hydroxide was heated at a constant temperature of about 45-50 o C and stirred for homogeneity. Results of the measurement over the frequency range showed drastic changes on the dielectric properties in the first 3 minutes of the reaction and after 3 minutes, the dielectric properties slowly decreased and approached the dielectric properties of biodiesel or glycerin. This study gives valuable information on the optimum mixing time for microwave transesterification reaction. These properties could be used to estimate absorbed power by the mixture for application in microwave transesterification process as dielectric loss of the mixture changed from 20 to about 0.5 as the transesterification reaction was completed.

Keyword: Microwave dielectric; Transesterification reaction; Palm biodiesel production