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The Optimization of Ozonolysis Reaction For Synthesis of Biopolyol From Used Palm Cooking Oil

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Abstract

Biopolyol is a raw material for synthesis of polyurethanes which is used as thermoset and thermoplastic materials, adhesives, rigid or non-rigid foams and also for coating. The utilization of waste edible oil as feedstock for synthesis of biopolyol has attracted some researchers. However, there is little attention focused on the application of ozone technology for synthesis of biopolyol from used cooking oil through ozonolysis reaction. Response surface methodology was performed to determine the optimal operating condition in the synthesis of biopolyol using ozone and sorbitol as a hydroxyl group source. The influence of input variables such as temperature, reaction time, molar ratio of oil to sorbitol and ozone concentration on hydroxyl value quantified was studied. The optimal condition was determined by high amount of hydroxyl value resulted from response surface method which used the experimental data. The ozonolysis reaction was conducted in a batch reactor equipped with agitator, tube sparger, thermocouple, reflux condenser and potassium iodide trap. Central composite design with four independent variables and one response variable was performed to determine the influence of independent variables on output variable of hydroxyl value of biopolyol. The hydroxyl value of polyol is a quadratic function of molar ratio of oil to methanol and a linear function of reaction temperature. The optimal operating condition was achieved at a temperature of 25°C, a reaction time of 5 hours, molar ratio of used cooking oil to sorbitol is 1:7 and ozone concentration about 4.8%.

Keywords: Ozonolysis; Biopolyol; Hydroxyl value; Used cooking oil; Palm oil