

Methyl Esterification of Free Fatty Acids of Rapeseed Oil as Treated in Supercritical Methanol

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Keywords: Methyl Esterification, Free Fatty Acids, Supercritical Methanol, Biodiesel Fuel, Energy Engineering

Commercially available crude oils and fats contain on average 0.5–3% free fatty acids. These free fatty acids are known to react with the alkaline catalyst and form saponified products during transesterification reactions for biodiesel fuel production in the conventional commercial process. Purification of the products therefore becomes necessary after the reaction. In addition, it causes a longer production process and increases the production costs. For this aspect, supercritical methanol method without using any catalyst is evaluated in this work for reaction of free fatty acids. As a result, complete conversion is achieved for saturated fatty acids to methyl esters at temperatures above 400°C, whereas for unsaturated fatty acids, lower temperature of 350°C is appropriate, and higher temperature resulted in a degradation of the products. Consequently, a conversion of free fatty acids to methyl esters is highest, over 95%, when treated at 350°C. Fortunately, this temperature treatment is also most appropriate for transesterification of triglycerides. Thus, the overall conversion process of rapeseed oil to methyl esters is concluded to be adequate at 350°C. This finding supports the superiority of supercritical methanol method on biodiesel fuel production, compared with the conventional method, in which the production process becomes much simpler and increases the total yield due to the methyl esters produced from free fatty acids.