

Produksi Biodiesel dengan Reaksi Transesterifikasi dari Lemak Daging Sapi Menggunakan Katalis Kalsium Oksida (CaO) yang Diperoleh dari Cangkang Telur Puyuh melalui Proses Kalsinasi = Biodiesel Production by Transesterification Reaction from Beef Tallow Using Calcium Oxide (CaO) Catalyst Obtained through Quail Eggshells by Calcination Process

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Abstrak

Transesterifikasi adalah reaksi kimia yang mengubah minyak hewani menjadi biodiesel yang berguna melalui proses kimia transesterifikasi. Pada penelitian ini, biodiesel diproduksi dengan cara mentransesterifikasi lemak sapi dalam reaktor dengan katalis CaO berbahan dasar cangkang telur puyuh. Enam sampel menjalani transesterifikasi pada suhu 55 °C dengan perbedaan jumlah katalis yang digunakan (1,5 wt%, 6,5 wt%, dan 10 wt%). Variasi jenis katalis, yang terdiri dari katalis komersial dan berbasis limbah, juga dipakai dalam penelitian ini. Katalis CaO berbasis limbah disintesis dari cangkang telur puyuh melalui proses kalsinasi pada suhu 900 °C dengan durasi 2 jam. Katalis berhasil disiapkan dengan persentase hasil 92,4% kalsium oksida. Hasil pengujian sampel terbaik ditunjukkan oleh biodiesel dengan penggunaan katalis berbasis limbah 6,5% dan katalis komersial 6,5%. Untuk biodiesel dengan katalis berbasis limbah 6,5%, diperoleh *yield* 91,747%, densitas 856 kg/m³, viskositas 5,2915 mm²/cst, angka keasaman 0,94 mg-KOH/g, dan angka iodin 33,96 g-I₂/100g. Untuk biodiesel dengan katalis komersial 6,5% diperoleh *yield* 90,236%, densitas 861,1 kg/m³, viskositas 5,414 mm²/cst, angka keasaman 4,13 mg-KOH/g, dan angka iodin 29,37 g-I₂/100g. Angka keasaman standar dengan maksimum 0,5 mg-KOH/g tidak dipenuhi oleh kedua sampel.

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Transesterification is a chemical reaction that transforms animal oils into useful biodiesel by the chemical process of transesterification. In this study, the biodiesel is produced by transesterifying beef tallow in a reactor with a CaO catalyst made from quail eggshell. Six samples are subjected to transesterification at a temperature of 55 °C with different amounts of catalyst being used (1.5 wt%, 6.5 wt%, and 10 wt%). A variation of catalyst type, that consists of the commercial and waste-based catalyst, is also integrated to this study. Waste-based CaO catalyst is synthesized from quail eggshells through a calcination process at 900 °C with the duration of 2 hours. The catalyst was successfully prepared with the yield percentage of 92.4% calcium oxide. The best sample test results were exhibited by the biodiesel with the usage of 6.5% waste-based catalyst and 6.5% commercial catalyst. For biodiesel with 6.5% waste-based catalyst, 91.747% yield, 856 kg/m³ density, 5.2915 mm²/cst viscosity, 0.94 mg-KOH/g acidity number, and 33.96 g-I₂/100g iodine number were obtained. For biodiesel with 6,5% commercial catalyst, 90.236% yield, 861.1 kg/m³ density, 5.414 mm²/cst viscosity, 4.13 mg-KOH/g acidity number, and 29.37 g-I₂/100g iodine number were obtained. The standard acidity number with the maximum of 0.5 mg-KOH/g is not satisfied by both samples.