



SYNTHESIS AND CHARACTERIZATION OF ACETOL FROM PALM-BASED GLYCEROL

(Sintesis dan Pencirian Asetol daripada Gliserol Berasaskan Sawit)

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Abstract

Glycerol conversion to value-added product, acetol was studied through the dehydration reaction of glycerol catalyzed by copper chromite in a single step reactive distillation. The physical properties of the synthesized acetol such as its appearance, density and viscosity were compared with those of a commercial product. The effects of reaction temperature (190 °C and 200 °C), reaction period (1.5-7 hours), catalyst loading (0.63-7.0%) and water content (2-20% w/w) in the glycerol feedstock were studied to optimize its production. The results show conversion of glycerol increased with the increase of reaction period and catalyst loading while the presence of water in the glycerol feedstock decreased the conversion and also reduced the residue which provided ease of removal and recycles the catalyst. Optimum conditions for the conversion of glycerol to acetol was at a reaction period of 3.5 hours with 2.5% catalyst concentration and 200 °C reaction temperature without dilution where 64.47% of the product was obtained. Fourier transform infrared (FTIR), gas chromatography (GC) and nuclear magnetic resonance (NMR) were used to characterize and validate the product from the dehydration reaction of glycerol. FTIR spectrum of the product showed stretching of the carbonyl group which suggested that acetol had been successfully synthesized. All of the analyses (GC and NMR) validate that acetol was successfully synthesized.

Keywords: acetol, dehydration, glycerol, palm-based, synthesis

Abstrak

Penukaran gliserol kepada produk bernilai tinggi, asetol telah dikaji melalui tindak balas nyah-hidrat gliserol dimangkin oleh kuprum kromit dalam penyulingan reaktif satu langkah. Ciri-ciri fizikal asetol yang dihasilkan seperti penampilan, ketumpatan dan kelikatan telah dibandingkan dengan produk komersil. Kesan suhu tindak balas (190 °C and 200 °C), tempoh tindak balas (1.5-7jam), kuantiti mangkin (0.63-7.0%) dan kandungan air (2-20% w/w) dalam stok suapan gliserol dikaji untuk mengoptimumkan penghasilannya. Hasil kajian menunjukkan penukaran gliserol meningkat dengan peningkatan tempoh tindak balas dan kuantiti mangkin manakala kehadiran air dalam stok suapan gliserol merendahkan penukaran dan juga mengurangkan sisa dimana memudahkan pengasingan dan kitar semula mangkin. Keadaan optimum untuk penukaran gliserol kepada asetol adalah pada tempoh tindak balas sebanyak 3.5 jam dengan kuantiti mangkin 2.5% dan 200 °C suhu tindak balas tanpa pencairan stok suapan dimana ia memperoleh 64.4% produk. Inframerah transformasi Fourier (FTIR), kromatografi gas (GC) dan resonans magnetik