

## Glycerolysis of Palm Oil Using Copper Oxide Nanoparticles Combined With Homogeneous Base Catalyst

Huei Ruey Ong,<sup>ab</sup> Md. Maksudur Rahman Khan,\*<sup>a</sup> Ridzuan Ramli,<sup>b</sup> Rosli Mohd Yunus<sup>a</sup> and Md. Wasikur Rahman<sup>a</sup>

<sup>a</sup>Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, 26300 Gambang Pahang, Malaysia

<sup>b</sup>Malaysian Palm Oil Board (MPOB), No. 6, Persiaran Institusi, Bandar baru bangi, 43000 Kajang, Malaysia

### ABSTRACT

In the present work, a new catalyst system composed of copper oxide nanoparticles (CuO-nano) along with a conventional homogeneous base catalyst (NaOH) for the glycerolysis of palm oil to produce monoglycerides (MG) was proposed. CuO-nano was synthesized in glycerol and directly used in the glycerolysis reactions, which formed a pseudo-homogeneous system. The production of MG and diglycerides (DG) from oil was monitored by using <sup>1</sup>H-NMR, <sup>13</sup>C-NMR and HPLC. When compared with the conventional NaOH catalyst, CuO-nano used alone showed less activity, but adding NaOH to the CuO-nano exhibited a synergistic effect by increasing the MG yield significantly. The oil conversion, MG and DG yield were achieved at 95, 71 and 24%, respectively, for the new catalyst system composed of CuO-nano and NaOH. The mechanism of the glycerolysis reaction over CuO-nano and NaOH was elucidated.

**DOI: 10.1039/C6NJ01461E**