A new catalyst system in transesterification of palm olein: Tolerance of water and free fatty acids

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ABSTRACT

Boiler ash (BA) from oil palm empty fruit bunches used as pseudo-homogeneous base catalyst to transesterify palm olein at mild reaction conditions (3 wt.% BA dried at 105 °C, 2 h; 15:1 methanol to oil molar ratio at methanol refluxing temperature in 0.5 h) yielded 90% methyl esters. However, the catalyst showed low water (0 wt.%) and FFA (1 wt.%) tolerance. Laboratory calcium oxide (Lab CaO, calcined at 900 °C, 2 h) was used as a drying agent and to enhance the FFA tolerance of BA. Transesterification with Lab CaO (5 wt.% Lab-CaO; 13:1 methanol to oil molar ratio) exhibited good tolerance towards 3 wt.% water and 4 wt.% FFA but only 67% methyl esters were produced in 0.5 h. A mixture of BA-Lab CaO (stoichiometric ratio for $Ca(OH)_2$ formation) catalyzed transesterification yielded 95% methyl esters in 0.5 h and with higher water (3 wt.%) and FFA (4 wt.%) tolerance.

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