Pyrolytic–deoxygenation of triglyceride via natural waste shell derived $Ca(OH)_2$ nanocatalyst

ABSTRACT

Cracking–Deoxygenation process is one of the important reaction pathways for the production of biofuel with desirable *n*-C_{17} hydrocarbon chain via removal of oxygen compounds. Calcium-based catalyst has attracted much attention in deoxygenation process due its relatively high capacity in removing oxygenated compounds in the form of CO_2 and CO under decarboxylation and decarbonylation reaction, respectively. In the present study, deoxygenation of triolein was investigated using $Ca(OH)_2$ nanocatalyst derived from low cost natural waste shells. The $Ca(OH)_2$ nanocatalyst was prepared via integration techniques between surfactant treatment (anionic and non-ionic) and wet sonochemical effect. Results showed that sonochemically assisted surfactant treatment has successfully enhanced the physicochemical properties of $Ca(OH)_2$ nanocatalyst in terms of nano-particle sizes (~50 nm), high surface area (~130 m^2 g−1), large porosity (~18.6 nm) and strong basic strength. The presence of superior properties from surfactant treated $Ca(OH)_2$ nanocatalysts rendered high deoxygenation degree, which are capable of producing high alkane and alkene selectivity in chain length of n-C_{17} (high value of $C_{17}/(n\text{-}C_{17} + n\text{-}C_{18})$ ratio = 0.88). Furthermore, both $Ca(OH)_2$–EG and $Ca(OH)_2$–CTAB nanocatalysts showed high reactivity with 47.37% and 44.50%, respectively in total liquid hydrocarbon content of triolein conversion with high H/C and low O/C ratio.

Keyword: Cracking; Decarboxylation–decarbonylation; Calcium oxide; Clamshell; Hydrocarbon