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Catalytic Deoxygenation of Non-Edible Oil to Renewable Fuel by Using Calcium-Based Nanocatalyst

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Abstract : Cracking–Deoxygenation process is one of the important reaction pathways for the production of bio-fuel with desirable n-C17 hydrocarbon chain via removal of oxygen compounds. Calcium-based catalyst has attracted much attention in deoxygenation process due to 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 nanoparticle sizes (~50 nm), high surface area(~130 m^2g^{-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 is capable of producing high alkane and alkene selectivity in chain length of n-C17(high value of C17/(n-C17+ n-C18)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.

Keywords : clamshell, cracking, decarboxylation-decarbonylation, hydrocarbon
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