Catalytic deoxygenation by H2-free single-step conversion of free fatty acid feedstock over a Co-Ag carbon-based catalyst for green diesel production

ABSTRACT

A family of activated carbon-supported Co-Ag catalysts, synthesised through incipient wetness impregnation, have been evaluated for the deoxygenation of palm fatty acid distillate (PFAD) and inedible feedstocks (jatropha oil and waste cooking oil) to green diesel. High deoxygenation efficiency and conversion of PFAD to hydrocarbon liquid products through decarboxylation/decarbonylation (deCOx) is observed, with $Co_{(10wt.\%)}$-$Ag_{(5-\ 20wt.\%)}$/AC exhibiting the greatest hydrocarbon (C_8–C_{20}) fractions yield of 92 % and 95 % (C_{15}+C_{17}) selectivity after 120 min reaction at 350 ◦C. These results suggested the synergistic effect between the active metals, Co-Ag, and the activated carbon support, creating acid-base Bronsted ¨ sites, which significantly facilitated the selective deCOx pathway of the fatty acid. The catalyst $Co_{(10wt.\%)}$-$Ag_{(10wt.\%)}$/AC was capable of deoxygenation the PFAD over eight cycles. Thus, it can be believed a potentially promising catalyst for the production of green diesel, at the same time providing economic opportunities and added value to the palm oil industry.