A promoter effect on hydrodeoxygenation reactions of oleic acid by zeolite beta catalysts

ABSTRACT

In this study, various metal-modified zeolite beta-based catalysts such as $La_{(10)}zeo_{(90)}$, $Co_{(10)}zeo_{(90)}$, $Fe_{(10)}zeo_{(90)}$, $Mg_{(10)}zeo_{(90)}$, $Mn_{(10)}zeo_{(90)}$ and $Zn_{(10)}zeo_{(90)}$ were investigated in the hydrodeoxygenation (HDO) of oleic acid (OA) to produce renewable diesel. The $La_{(10)}zeo_{(90)}$ catalyst showed a conversion of OA up to 99 % with 83 % C_{15} and C_{17} selectivity after the reaction at 350 ◦C for 2 h under 4 MPa H_2 pressure. The superior activity of $La_{(10)}zeo_{(90)}$ was attributed to the synergistic interaction between La-Si-Al, a sufficient amount of weak+ medium acid sites and excellent textural properties (large pore diameter). Larger pore diameter of $La_{(10)}zeo_{(90)}$ is highly desirable as it will generate greater diffusion of bulky molecules, thereby improving the accessibility of the reactant and hence excellent catalytic activity. The vacuum distillation was used to purify the crude liquid product (CLP), producing high-quality diesel fractions mainly comprising C_{14}, C_{15}, and C_{17} fractions.