In-situ operando and ex-situ study on light hydrocarbon-like-diesel and catalyst deactivation kinetic and mechanism study during deoxygenation of sludge oil

ABSTRACT

Deoxygenation is a highly significant means of generating oxygen-free hydrocarbon fuels from liquid biomass. This study will deoxygenate sludge palm oil (FFA % = 42.35%) in an H2-free atmosphere through a series of Mn-Co supported AC catalysts (MnO0.5CoO0.5/AC, Mn0.5Co0.5S/AC and Mn0.5Co0.5P/AC). The XAS in-situ results confirm that the preparation method of formation the catalyst structure was successful. The catalytic results show that by oligomerizing unsaturated fatty acids produced during Diels-Alder reactions or radical additions, the MnO0.5)CoO0.5/AC can largely enhance the production of heavy products. It is a straightforward process to transform these heavy products into coke species, which enables the rapid deactivation of the catalyst. This study additionally showed that AC-supported sulphide and phosphide Mn-Co catalysts are hugely beneficial for steadily and reliably acquiring an above-average yield of diesel-range hydrocarbons at substantially reduced temperatures whilst simultaneously effectively impeding catalyst deactivation during deoxygenation. The deactivation kinetic study conform that the deactivation happens by the coke formation and flow the second order deactivation.