Lump Kinetic Model of Hydrocracking Reactions of Heavy Oils over Oil-Dispersed Mo Catalyst

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A lump kinetic model for hydrocracking of heavy oils is developed where the developed model includes five lumps (unconverted residue, vacuum gas oil, distillates, naphtha and gases), metals and sulfur components. To obtain the experimental data, a continuous-stirred tank reactor has been used and the experiments have been carried out using Mo-based oil-dispersed catalyst precursor and vacuum residue from the refinery company in South Korea. The reaction temperature has varied in the range of 410 – 440 ℃ and the reactor pressure has varied in the range of 140 – 160 bar. For the efficient parameter estimation, the genetic algorithms have been adopted as a heuristic optimization method since the number of kinetic parameters to be estimated is 34 and the object function for the parameter estimation is highly nonlinear. The prediction of the hydrocracked product composition has shown the good agreement so this work is considered to contribute to designing an appropriate slurry-type hydrocracker.