

### Kinetic study for hydrocracking of heavy oil with dispersed catalyst

Pham Hai Hung<sup>1,2</sup>, 고강석<sup>1,2,†</sup>, 노남선<sup>1</sup>, 권은희<sup>1</sup>, 김광호<sup>1</sup>, 임석현<sup>1</sup>

<sup>1</sup>한국에너지기술연구원; <sup>2</sup>한국화학연구원

(ksgo78@kier.re.kr<sup>†</sup>)

A five-lump model previously reported in the literature was used for the kinetic modeling of vacuum residue (VR: 524 °C+) hydrocracking in a CSTR with a commercial dispersed catalyst (Mo-octoate). The kinetic experiment was carried out at the severe operating condition of 410 – 440 °C, 1500 gas to oil ratio, 0.25 – 1 LHSV, and 500 ppm concentration of Mo-octoate. The model consists of five lumps classified by the boiling points with ten reaction pathways. The lumps are gases, naphtha (177 °C-), middle distillates (MD: 177 – 350 °C), vacuum gas oil (VGO: 350 – 524 °C), and vacuum residue (VR: 524 °C+). The hydrocracking of VR, VGO, and MD exhibited a heavier lump with increasing reaction temperature. In addition, the secondary reaction of VGO mainly towards MD was observed at high temperature and high conversion of VR. The reaction order of VR hydrocracking was found to follow fourth-order. The kinetic model well fit experimental products yield values with an average absolute error of less than 5%.