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Analysis of oil sands bitumen pyrolysis based on thermogravimetry and Py-GC/MS

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Increasing demand for energy leads to continuous increase of crude oil production and decrease in recoverable deposits, causing the rise in the price of petroleum products. Unconventional oils such as oil sands bitumen and extra heavy oils have been emerging as attractive alternative energy resourcesdue to their large amounts of reserves compared to the remaining conventional oils and the potential to produce transportation fuels.In order to make full use of unconventional oils, upgrading technologies are indispensable. Pyrolysis is a relatively simple upgrading process and can easily produce light oils from unconventional oils.To understand the pyrolysis processes,it is important to know characteristics of pyrolysis reaction and kinetic parameters.In this study, non-isothermal pyrolysis of oil sands bitumen was conductedunder several constant heating rates to examine its pyrolysis behavior and kinetics using a thermogravimetric analyzer. Activation energyof pyrolysis was determined with kinetic analysis methods such as the Friedman method. Then, distributed activation energy model (DAEM) was used to determine proper kinetic parameters for the non-isothermal pyrolysis of oil sands bitumen. In addition, stepwise pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS) analysis was carried out.The mass chromatograms obtained at each temperature were correlated with pyrolysis temperatures to evaluate pyrolysis behavior and to interpret possible pyrolysis mechanisms of oil sands bitumen.

Biography

Sangcheol Shin is in the Ph.D.course of the Department of Chemical and Biological Engineering at Korea University.He got a Bachelor degree in the same departmentand university.He is currently working on heavy oil upgrading processes using pyrolysis reaction and solvent deasphalting technique.

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