EXPERIMENTAL STUDY ON THE CO-PROCESSING OF COAL WITH HEAVY OILS

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Abstract:
Fossil fuel demand in China will maintain a strongly rising tendency with the continuous development of Chinese economy. China's dependence on foreign oil has reached to some 57% in 2013. The direct coal liquefaction (DCL) has been attracting much attention in China, which can produce alternative transportation fuels to provide a stable supply of oil. Compared with the DCL process, a number of additional advantages may accrue from co-processing coal and resid feedstocks, such as improved yields of liquid or distillate products, inhibition of coke formation, and enhanced demetalation of the liquid products.

The intent of this work was to evaluate the synergistic effect between coal and heavy oil by using different combinations under thermal conditions. Four Chinese coals (three sub-bituminous coals and one lignite) were used in this study. Two heavy oils were employed: Slurry Oil (SO) from a FCC unit and Heavy Cycling Oil (HCO) from a DCC unit. A 2L semibatch reactor and the unsupported (dispersed) catalysts investigated in this study.

The results show that coprocessing can significantly enhance coal conversion and liquid yields. HCO was superior to SO for the conversion of coals to liquid or soluble products. The differences of structural characteristics between feedstocks have a marked impact on coal/oil hydro-coprocessing. HCO have higher content of aromatics with two or three rings, so that it has a better performance on improving the conversion. Gum and other macromolecules in Slurry Oil could favor the formation of coke and lower light oil yield during coal/oil co-processing.

Keywords: coal/oil co-processing, heavy oils, Slurry Oil, Heavy Cycling Oil

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