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# Adsorptive Desulfurization of Tire Pyrolytic Oil Using Cu(I)–Y Zeolite via π-Complexation

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**Abstract :** The accelerating requirement to reach 0% sulfur content in liquid fuels demands researchers to seek efficient alternative technologies to challenge the predicament. In this current study, the adsorption capabilities of modified Cu(I)-Y zeolite were tested for removal of organosulfur compounds (OSC) present in TPO. The π-complexation-based adsorbent was obtained by ion exchanging Y-zeolite with Cu+ cation using liquid phase ion exchange (LPIE). Preparation of the adsorbent involved firstly ion-exchange between Na-Y zeolite with a Cu(NO3)2 aqueous solution of 0.5M for 48 hours followed by reduction of Cu2+ to Cu+. Batch studies for TPO in comparison with model diesel comprising of sulfur compounds such as thiophene (TH), benzothiophene (BTH), dibenzothiophene (DBT) and 4,6-dimethyldibenzothiophe (4,6-DMDBT) showed that modified Cu(I)-Y zeolite is an effective adsorbent for removal of OSC in liquid fuels. The effect of multiple operating conditions such as adsorbent dosage, reaction time and temperature were studied to optimize the process. For model diesel fuel, the selectivity for adsorption of sulfur compounds followed the order 4,6-DMDBT> DBT> BTH> TH. Interpretation of the results was justified using the molecular orbital theory and calculations. Langmuir and Freundlich isotherms were used to predict adsorption of the reaction mixture. The Cu(I)-Y zeolite is fully regeneratable and this is achieved by a simple procedure of blowing the adsorbent with air at 350 °C, followed by reactivation at 450 °C in a rich helium surrounding.

**Keywords :** adsorption, desulfurization, TPO, zeolite
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