Adsorption properties of lithium-modified mesoporous silica toward sulfur and nitrogen compounds in liquid and gas fuels

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In this work, two types of lithium modified mesoporous silica adsorbents were prepared for selective removal of nitrogen compounds from the residue hydrodesulfurization diesel fuel provided by a refinery factory (430.2 ppmw S and 271.3 ppmw N). In batch experiments run at 15 °C and 45 °C, adsorption performance such as the adsorption capacity, adsorption rate, and the regeneration ability toward nitrogen and sulfur compounds, was measured and compared with the previous results of Si-Zr cogel.
Dynamic adsorption properties toward methylmercaptan as an odorant in the city gas were also tested. A mixture of CH4 and CH3SH (291 μmol/mol) was used as a feed gas. The adsorption capacities were determined from breakthrough experiments performed at different temperatures and flow rates. The dynamic thermal desorption of adsorbents was studied by stepwise desorption experiments with N2 or CH4. The lithium-modified mesoporous silica adsorbents exhibited a much stronger adsorption affinity for N-compounds than for S-compounds in the liquid fuel. And these materials showed ability to adsorb trace amount of sulfur compound from the gas and be easily regenerated.