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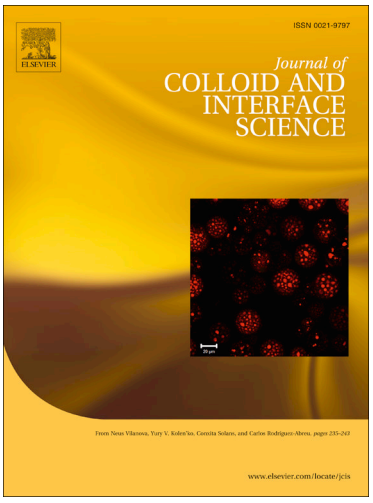

Highly efficient and selective removal of N-heterocyclic aromatic contaminants from liquid fuels in a Ag(I) functionalized metal-organic framework: contribution of multiple interaction sites

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Highly efficient and selective removal of N-heterocyclic aromatic contaminants from liquid fuels in a Ag(I) functionalized metal-organic framework: contribution of multiple interaction sites.

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Abstract

An adsorbent with multiple interaction sites for the adsorption of nitrogen-containing compounds (NCCs) has been realized in a silver ion functionalized Cr^{3+} based metal-organic framework (Cr)-MIL-101-SO_3Ag. The adsorptive denitrogenation performance of (Cr)-MIL-101-SO_3Ag was evaluated in a batch adsorption system in terms of both its adsorption capacity and selectivity, of which, quinoline and indole were selected as representative organonitrogen contaminants in liquid fuels. (Cr)-MIL-101-SO_3Ag could interact with NCCs through multiple ways simultaneously, which exhibited about 50% higher adsorption capacity compared to (Cr)-MIL-101-SO_3H, and a still high level of adsorption amount could be remained even in a model fuel where toluene (15% v) was added as a co-solvent and benzothiophene (BT) was added as a competitive adsorbate. The highly efficient and selective denitrogenation performance, we speculated was a combined results of these multiple interaction sites. The immobilized Ag(I) sites could strongly interact with NCCs through π-complexation, which was thought to be responsible for its high adsorption capacity, meanwhile, the hard lewis acid site (Cr^{3+}), which could preferentially interact with the hard nitrogen bases and the acid-base interaction between nitrogen bases and remaining -SO_3H groups endowed (Cr)-MIL-101-SO_3Ag with high selectivity over BT and other aromatic compounds. Futhermore, the enhanced interaction of (Cr)-MIL-101-SO_3Ag with NCCs was also confirmed from

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