DISPERSION OF NICKEL NANOPARTICLES IN THE CAGES OF METAL-ORGANIC FRAMEWORK: AN EFFICIENT SORBENT FOR ADSORPTIVE REMOVAL OF THIOPHENE

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Abstract - Nickel NPs (<2 nm) were confined in highly porous metalorganic framework (MOF; here, MIL-101(Cr)) via a facile strategy at ambient conditions. With the characterization of HRTEM, XRD, N_2physisorption, SEM, XPS, FT-IR, TPR, FT-IR, NH_3-TPD and TG-DTG, the resulting nickel NPs up to 20 wt % first-ever were detected to be uniformly dispersed, smaller in size and easily reducible in MIL-101(Cr) cages retaining their original crystal structure. The efficiencies of the new sorbents in adsorptive removal of thiophene were investigated. Compared with pristine MIL-101, the capacity of sulfur adsorption of modified MIL-101 enhanced for thiophene, and obey the order 20Ni-MIL-101 > 10Ni-MIL-101 > 30Ni-MIL-101 >MIL-101. The improved adsorption properties were linked with surface chemistry and texture of MIL-101 support. Pseudosecond-order kinetic and Langmuir models showed best fit of thiophene adsorption on MIL-101 and Ni-containing MIL-101 samples. Moreover, the rate controlling step for thiophene adsorption was Intraparticle diffusion.