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Confinement of mesopores within ZSM-5 and functionalization with Ni NPs for deep desulfurization

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ABSTRACT

Adsorptive desulfurization of transportation fuels can be affected by high diffusion limitations in porous sorbents due to the existence of larger kinetic dimensions of sulfur compounds and aromatics. In this contribution, we explored that metal based hierarchically ZSM-5-based micro-/mesostructures (MMZ) can overcome such scarcities without compromising the desulfurization activity. The mesopores of MMZ reduces path length for diffusion to the zeolite internal sites, and the metals (here, Ni) not only establish strong interactions but also enhances the adsorption configurations. The MMZ was synthesized by subjecting commercial H form ZSM-5 (SiO₂/Al₂O₃ = dissolution-self-assembly via sequential and doped with Ni via 28) ultrasound-assisted impregnation. The samples were characterized by N₂ sorption, NH₃-TPD, XRD, H₂-TPR TEM, SEM, FT-IR, elemental distribution mapping, and XPS techniques. The results revealed that high surface area up to 831 m².g⁻¹ well-ordered mesostructures obtained when ZSM-5 was subjected to dissolution in

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