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Fazle Subhan, Sobia Aslam, Zifeng Yan, Zhen Liu, U.J. Etim, Abdul Wadood, Rooh Ullah

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

Fazle Subhan[a,b]*, Sobia Aslam[a,b], Zifeng Yan[a]*, Zhen Liu[a] . U. J. Etim[a], Abdul Wadood[c], Rooh Ullah[a]

a State Key Laboratory of Heavy Oil Processing, China University of Petroleum, Qingdao 266580, China
b Department of Chemistry, Abdul Wali Khan University Mardan, K.P, Pakistan
c Department of Biochemistry, Abdul Wali Khan University Mardan, K.P, Pakistan

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 (SiO_2/Al_2O_3 = 28) via sequential dissolution-self-assembly and doped with Ni via ultrasound-assisted impregnation. The samples were characterized by N_2 sorption, NH_3-TPD, XRD, H_2-TPR TEM, SEM, FT-IR, elemental distribution mapping, and XPS techniques. The results revealed that high surface area up to 831 $m^2.g^{-1}$ and well-ordered mesostructures obtained when ZSM-5 was subjected to dissolution in

*Corresponding author Tel. +92-9065467 (F.Subhan) , +86-532-86981296 (Z.Yan); *E-mail:* fazle@awkum.edu.pk (F.Subhan), zfyancat@upc.edu.cn (Z.Yan)