

536a Synthesis and Characterization of Highly Ordered Ni-MCM-41 Mesoporous Molecular Sieves

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Highly ordered Ni-MCM-41 samples with nearly atomically dispersed nickel ions were prepared reproducibly and characterized extensively by nitrogen physisorption, XRD, TEM, hydrogen TPR, UV-vis spectroscopy, FTIR, and X-ray absorption spectroscopy. Results have shown that physicochemical properties of Ni-MCM-41 (e.g., structural order, reducibility, density of surface silanol group, and the distribution of nickel ions in the silica framework etc.) can be controlled precisely; and they are greatly dependent on the MCM-41 synthesis parameters, for example, pH and the tetramethylammonium group concentration in the initial synthesis solution. In this research, we also demonstrated a method for designing Ni-MCM-41 catalysts for application SWNT synthesis, CO and CO₂ methanation reaction, all systems which require catalyst exposure to reducing environments which normally lead to formation of large metallic Ni clusters.