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Physical properties and catalytic activity of mesoporous material Ti-MCM-41

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Ti-substituted MCM-41 mesoporous material with Si/Ti mole ratio of 16, 40, 60, 80 and 100 have been prepared by direct hydrothermal synthesis method using two different types of particle size silica source. All samples have been characterized by X-ray diffraction, N_2 adsorption and SEM techniques. All samples show at least one major peak labeled as d_{100} at 2 theta less than 3^o and it characterized that all the materials have a hexagonal structure. The incorporation of Ti atom in MCM-41 increased the d_{100} value compared with silica MCM-41 and it was indicate formation of Ti in its framework. XRD pattern of Ti-MCM-41 synthesized from silica "ultrapure" (particle size 40 – 60 μm) gives totally amorphous structure compared with Ti-MCM-41 derived from silica "cabosil" (particle size 0.02 μm). This is shows that small particle of silica source gives better crystallinity of Ti-MCM-41 compared to bigger particle size of silica source. The BET analysis shows that increasing Ti loading will decrease the surface area. The pore size distribution from BJH analysis shows increasing upon increasing Ti content. Surface areas up to 1120 m^2/g with isotherms of type IV of all the samples are typical for hexagonal MCM-41 type ordered mesoporous materials. The epoxidation reaction of n-hexene with organic peroxide has been done using all the synthesized samples. The results shows Ti-MCM-41 derived from silica "cabosil" gives higher activity compared to silica "ultrapure". Ti-MCM-41 with Si/Ti mole ratio 100 is the best catalyst that produces highest conversion and selectivity. This is due to the active Ti species that presence in the silica MCM-41 framework.