

Synthesis of hierarchically ordered Macro-Mesoporous-Alumina with grainy wall of nanoparticles

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The facile synthesis of hierarchically ordered macro-mesoporous alumina with grainy wall from aluminum alkoxides as aluminum precursor, polystyrene spheres and pluronic as templates has been investigated. X-Ray diffraction (XRD), SEM, TEM, and N₂ adsorption and desorption results show that these macroporous aluminas possess a highly ordered porous structure with grainy wall. These macro-mesoporous aluminas have high surface area and large pore volume. By controlling the water amount in process of synthesis of aluminum oxide, grainy boehmite was found as an intermediate substance. The grain structure of alumina was formed by unchanged grain structure of boehmite after calcination. These materials are expected to be good candidates in catalysis due to the uniform pore structures, larger surface area and grainy wall structure, which can improve access of the high molecule weight reactants to the active sites. Loaded with Ni and K, the representative grainy wall macroporous alumina exhibits a high activity in steam catalytic cracking of vacuum residue, indicating the potential applications in heavy oil processing catalysis.