Synthesis of Magnesium Oxide for Removal of Sulfur- and Phosphorus-Containing Compounds

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Metal oxide particles have proven to be effective materials for adsorption and decomposition of a large amount of toxic and persistent chemicals. The important feature is to enhance the surface chemical reactivity toward incoming adsorbates. It is expected that the adsorption efficiency of magnesium oxide (MgO) is greater than commercially common used MgO. Magnesium oxides were synthesized by polyol-meditation thermolysis, hydrothermal, and aerogel methods for removal of methyl mercaptan (MM) from methane and dimethyl methylphosphonate (DMMP) from nitrogen. The physical property of MgO was controlled by using a calcination method. As-synthesized samples were characterized by XRD, BET, TGA, SEM, TEM, and FTIR. And their sorption capacity was evaluated by a dynamic sorption method at different temperatures. The surface area of nano-sized mesoporous MgO varied from 296.6 to 503.5 m^2/g, depending on the calcination procedure. Mesoporous MgO prepared by the 4-step calcination method, which had two additional steps in the significant decomposition temperature range, showed 2- to 11-times higher sorption capacity for methyl-mercaptan than mesoporous MgO prepared by other calcination methods.