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➤ ORAL PRESENTATION

Synthesis and applications of metal oxide and metal oxide/clay nanocatalysts by using hydrothermal synthesis method: A review

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Abstract

Hydrothermal synthesis method refers to the heterogeneous reaction medium that occurs in the presence of aqueous solvents or the mineralizers under high pressure and temperature to ensure in the dissolution and recrystallization of the materials that cannot to be dissolved under optimum conditions. Hydrothermal synthesis can to be defined as a heterogeneous chemical reaction that takes place in the presence of an aqueous or non-aqueous solvent in a closed system at the temperatures above room temperature and pressure values greater than 1 atm. This method has been widely accepted since 1960 and most complex oxides, silicates, phosphates, carbonates and practically all inorganic materials have been the synthesized by this method. The hydrothermal method include a wide range of the piezoelectric material preparation, including magnetic, optical, ceramic and single crystals, as well as multiple crystals. Especially hydrothermal technology provides many advantages for the inorganic materials compared to other synthesis methods. All forms of the inorganic materials, single crystals, powders, fibers, monolithic ceramic bodies, metallic coatings, polymers and ceramics can be prepared by using hydrothermal synthesis. Hydrothermal technology is a more environmentally amicable method than many other methods because it saves energy in low temperature processes, wastes can be recycled and it is suitable and reliable disposal of non-recyclable wastes. In the 1990s, changes were made in the hydrothermal method and the solvothermal technique by using solvents different from water was the developed and research focused on the physicochemical properties of these solvents. New batch and current reactors suitable for the special applications have been produced. In the 2000s, the hydrothermal method has been used in the production of nano materials. The hydrothermal method is a very interesting method for the synthesis of the nano materials with excellent crystal quality since in the reaction temperature is below 200 °C. It is easy to be control the particle size and morphology by changing in the synthesis parameters in the hydrothermal method. It is a convenient method that allows in the material to be synthesized in the desired crystal phase. With the hydrothermal synthesis method, different metal oxide nanocatalysts such as the Fe₂O₃, SrTiO₃, In₂O₃, WO₃, V₂O₅, TiO₂, MoO₃, MoS₂, SiC and ZnFe₂O₄ can to be synthesized in the desired size.

Keywords: Hydrothermal synthesis, metal oxide/clay nanocatalysts, high pressure and temperature, inorganic materials, nano-size.