Synthesis of MgO microtubes and its exploitation as a support in low pressure ammonia synthesis

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Monoclinic hydromagnesite ($Mg_5(CO_3)_4(OH)_2$ $4H_2O$) flower-like structures of 2-3 μm diameter have been synthesized at room temperature by a simple precipitation method without using any template, catalyst, or surfactant. The as-synthesized flowers were further calcined at various temperatures to prepare monodispersed, nanofibrous MgO microtubes of aspect ratio ≈15. Both the precursor flowers and the MgO microtubes formed were characterized by powder XRD, TG-DTA, FT-IR, SEM, EDAX, HR-TEM, SAED, BET analysis and photoluminescence (PL) studies. A plausible mechanism for the formation of cubic MgO microtubes from monoclinic hydromagnesite flowers is proposed. The as-synthesized nanofibrous MgO microtubes have shown intense green and red emission. The more defective MgO microtubes formed in N_2 atmosphere at 400 °C showed the highest PL intensity and surface area. An attempt has been made to correlate the lattice parameter and the PL intensity. The as-sysnthesized MgO microtubes have been used as a catalytic support for Fe in the ammonia synthesis yielding around 0.5 mmols/litre/h/g of ammonia at atmospheric pressures and 400 °C.

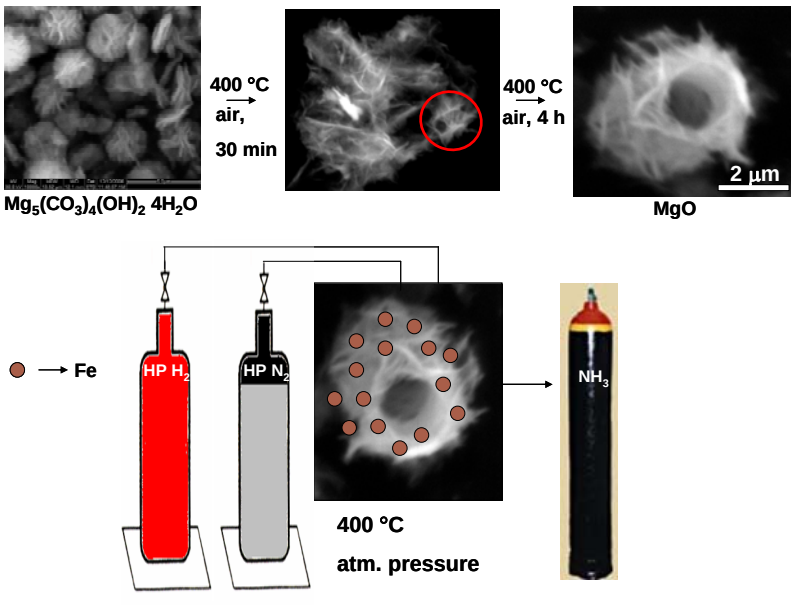

Figure 1. Transformation of Hydromagnesite flowers to MgO microtubes and its subsequent utilization in ammonia synthesis

References

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