Synthesis and Microstructure of Porous Mn-Oxides

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Generally, porous metal oxides find broad application in catalysis, chromatography, separation, environmental sensing, etc. The investigation of porous metal oxides is also important from an academic standpoint. The relationship between the synthesis and porosity of metal oxides was investigated. Different synthesis routes were used in the preparation of porous metal oxides, for example, sol-gel processing, sonochemistry, water-in-oil microemulsion processing, etc. The influence of various templates on the formation of porous metal oxides was investigated as well. Controlling the porous microstructure (nanostructure) of metal oxides is not an easy task, because this property strongly depends on the synthesis route. Small variations in the synthesis route also change the porosity, as well as the size and geometrical shape of particles. In the present work we are reporting new results in the synthesis of porous α-Mn_2O_3 and Mn_3O_4 particles. The porous Mn-oxide particles were synthesized by urea processing in combination with the thermal treatment of the precursor precipitated. The samples were characterized by XRD, FT-IR, DTA and FE SEM. Upon heating of the precursor at 600 °C, the α-Mn_2O_3 particles containing nanopores (cheese-like) were obtained. Most nanopores varied from ~ 20 to 60 nm, and some were close to ~ 100 nm in size. α-Mn_2O_3 showed a strong twinning effect. At 1100 ºC, a single crystal phase Mn_3O_4 particles were forming a 3D structure.

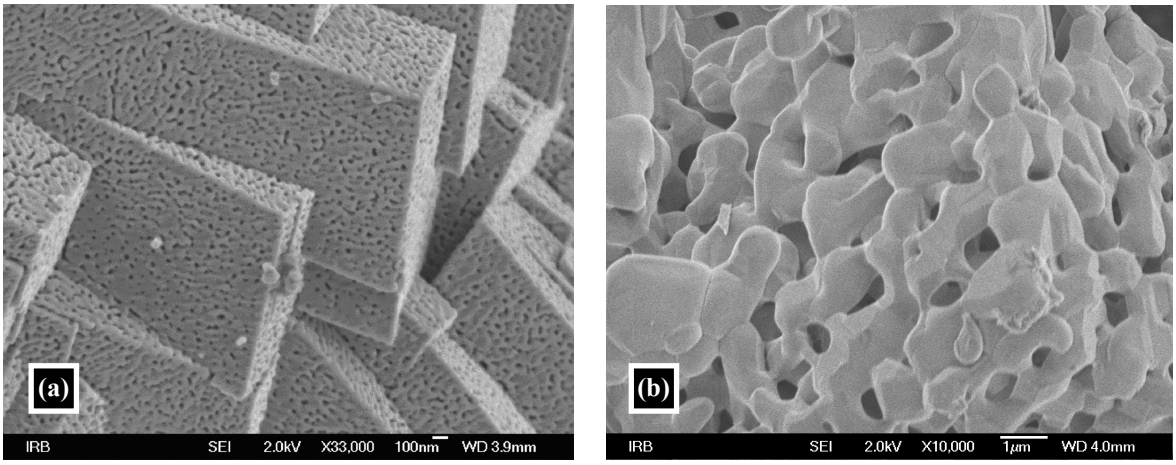

Fig. 1: FE SEM images of (a) nanoporous α-Mn_2O_3 and (b) microporous Mn_3O_4.