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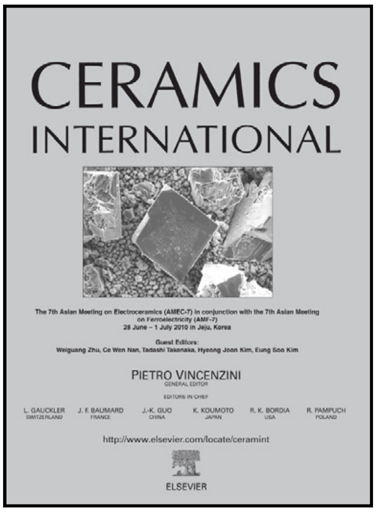

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Facile hydrothermal synthesis of cobalt manganese oxides spindles and their magnetic properties

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Abstract:

In the present work, $CoMnO_3$, Co_3O_4 and Mn_2O_3 powders were prepared by using a simple hydrothermal method, and the urea and polyvinyl alcohol (PVA) were served as the precipitator and surface active agent, respectively. The $CoMnO_3$ and Mn_2O_3 exhibit the same spindle-like structure with the size of several micrometers, while the Mn_2O_3 displays the nanosheet morphology, the as-prepared materials are all high degree of crystallinity. In addition, the magnetic properties discussion indicates that the as-prepared materials exhibit ferromagnetic and antiferromagnetic behaviors at 5 K and 300 K, respectively.

Keywords: $CoMnO_3$; Co_3O_4; Mn_2O_3; Hydrothermal method; Magnetic properties

1. Introduction

Inorganic 3d-transition metal oxides have attracted tremendous attention due to their remarkable catalytic, magnetic, optical and electrical properties as well as the potential application in engineering and science.[1-3] Among the multitudinous transition metal oxides, cobalt and manganese oxides (Co_3O_4, Mn_2O_3) obtained the wide applications in rechargeable Li-ion batteries,[4,5] heterogeneous catalysts,[6] gas sensors,[7] ceramic pigments,[8] magnetic materials[9-10] and energy storage.[11] Besides, Co_3O_4 and Mn_2O_3 can also be used as good electrocatalysts/co-catalysts for electrocatalytic/photocatalytic water splitting and exhibit superior performances.[12-15] To date, Many efforts have been employed to synthesize the Co_3O_4 and Mn_2O_3 *et al.* cobalt and manganese oxides. For example, Wang *et al.* prepared a variety of Co_3O_4 nanostructures through the hydrothermal process.[16] Yan *et al.* fabricated the Co_3O_4 nanoflower clusters by using a simple low-temperature hydrothermal method.[17] Yang *et al.* synthesized Co_3O_4 nanocrystals with different morphology such as nanocube, sphere and rhombododecahedron by employing differently charged surfactants and solvents in the solvothermal system.[18] Chen *et al.* prepared α-Mn_2O_3 microstructures, including spheres and polyhedrons, through a two-step hydrothermal and pyrolysis methods.[19] Cao *et al.* synthesized large-scale Mn_2O_3 homogeneous core/hollow-shell structures with cube-shaped and dumbbell-shaped morphologies through a facile and low-cost method.[20]

Compared with the simple transition metal oxides (A_xB_y), perovskite-type composite oxides (ABO_3, A = Co, Ca, La, Y, Dy; B = Mn, Co, Fe, Cr) has certain advantages in thermal, chemical and structural stability in material

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