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Structure- and Composition-Tunable Synthesis of Nanostructured Transition Metal Oxides Applicable for Electrodes in Lithium Ion Batteries

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The 1D nanostructures and their 3D hierarchical assembly of multicomponent transition metal oxides have been synthesized in a large quantity through a soft-chemical solution reaction. By adopting metal oxide powders or ion products as precursors, we are able to obtain cation-substituted manganese oxide nanostructures that are of special importance as cathode materials for lithium secondary batteries. The control of their reaction condition makes possible the tuning of their chemical composition, crystal structure, aspect ratio, and crystallite morphology. Also, we have found that the resulting nano-materials show promising electrode performances for lithium secondary batteries, which can be optimized by the tailoring of their chemical compositions. The present synthetic strategy can provide a very effective and general way of preparing the multicomponent transition metal oxide nanostructures with electrode applicability.