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Hydrothermal synthesis of metal oxide nanoparticles

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Abstract

Hydrothermal syntheses of nano- and microparticles of metal oxides of two types, $LiMO_n$ ($LiCoO_2$, $LiNiO_2$, $LiZnO_2$, and $LiCuO_2$) and MO_n (Ga_2O_3, CeO_2, CoO, ZnO, ZrO_2) were performed under continuous conditions in a tubular reactor with the use of supercritical water. The initial solutions were prepared by dissolving given amount of salts in water. The "mother" solution was introduced into supercritical water at ratio 2:10. The reaction was run at near critical temperatures and pressures of water. An important role in the synthesis of nanoparticles and the reproducibility of the results was played by the conditions of mixing of supercritical water and precursor solution flows. The morphology and composition of synthesized compounds were studied by scanning electron microscopy and X-ray diffraction. CoO syntheses from two different salts ($Co(CH_3COO)_2$ and $CoSO_4$) formed from the strong and weak acid was examined. Experiments were conducted in a flow reactor at the temperature 376 - 385 C and pressure 225 -235 atm. The effect of the "mother" solution concentration on the size and morphology of the formed metal oxide particles was studied.
The syntheses of $LiCoO_2$, $LiNiO_2$, $LiZnO_2$, $LiCuO_2$, CoO, ZrO_2, Ga_2O_3, and CeO_2 were most successful.

Biography

Prof. V.Anikeev has the highest academic degrees - doctor of science since 1992. He is the head of energy chemical engineering group in the Boreskov Institute of Catalysis SB RAS and member of Russian Chemical Society. He has published more than 176 papers in reputed journals. He is the Principal Investigator of the many Russian and International projects.