

Abstract Submitted
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Synthesis of Lithium Oxide Composite Nanoparticles with Spinel Structure by Induction Thermal Plasma TAKUYA KAGEYAMA, HIRO-TAKA SONE, Department of Chemical Systems and Engineering, Kyushu University, MANABU TANAKA, Department of Chemical Engineering, Kyushu University, DAISUKE OKAMOTO, Department of Chemical Systems and Engineering, Kyushu University, TAKAYUKI WATANABE, Department of Chemical Engineering, Kyushu University — Lithium oxide composite nanoparticles were successfully synthesized by induction thermal plasma. Powder mixtures of Li_2CO_3 and MnO_2 were injected into the induction thermal plasma at 20 kW-4MHz operated in different O_2 gas flow rates. The injected precursors were evaporated immediately in the high temperature region of the plasma and nanoparticles were produced through the quenching process. The particles were characterized by using X-ray diffraction (XRD) and transmission electron microscopy (TEM). The obtained results indicated that the nanoparticles of LiMn_2O_4 and LiMnO_2 were selectively synthesized by controlling partial pressure of O_2 in thermal plasma. Then formation mechanism of Li-based oxide nanoparticles was investigated on the basis of homogenous nucleation rate and thermodynamic consideration. In higher partial pressure of O_2 , MnO nucleates and Li oxide condense on the nuclei with relatively high condensation rate, resulting in single-phase LiMn_2O_4 formation. On the other hand, in lower partial pressure of O_2 , LiMnO_2 was obtained due to the lower condensation rate of Li oxide.

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