Sonochemical Coating of Nanosized Metal Oxide on Cathode Materials for Li-Rechargeable Batteries

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Sonochemistry, the use of power ultrasound to stimulate chemical process in liquid, is currently the focus in a wide range of chemical materials science and technology. The chemical effects of ultrasound arise from acoustic cavitation (the formation, growth, and implosive collapse of bubbles in a liquid). During cavitational collapse, intense heating of the bubbles occurs. These hot spots have temperatures of roughly 5000 K, pressures of about 1000 atmospheres, and cooling rates above 10^{10} K/s. These extreme conditions attained during bubble collapse have been exploited to prepare nanoparticles of metals, alloys, metal carbides, metal oxides, and metal sulfides. Ultrasonic cavitation in liquid-solid systems produces related phenomena. Cavity collapse near an extended solid surface becomes non-spherical, drives high speed jets of liquid into the surface, and creates shockwave damage to the surface. Gedanken *et al.* reported the various kind of metal and metal oxide coating on small substrates, such as submicron silia and alumina particles by sonochemical method. Recently, coating method that improves the structural instability of cathode materials for Li secondary batteries during cycling has been reported. Cho *et al.* reported sol-gel coating of various kind of metal oxide (Al_2O_3, ZrO_2, SnO_2, TiO_2, and B_2O_3) on cathode materials ($LiCoO_2$, $LiNiO_2$, $LiMnO_2$, and $LiMn_2O_4$) for Li-rechargeable batteries. In this study, sonochemical coating of nanosized matal oxide has been tried on cathode materials for Li-rechargeable batteries. The morphological, thermal, and electrochemical properties of coated particles were investigated by XRD, TEM, SEM/EDAX, TGA, DSC, and electrochemical methods. More detailed discussion of the coated materials will be made in the conference.

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