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## A study on the electrochemical/structural characteristics of Al<sub>2</sub>O<sub>3</sub> coated-LiMn<sub>2</sub>O<sub>4</sub> as positive electrode for lithium secondary battery

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The layered oxide, LiCoO<sub>2</sub>, LiNiO<sub>2</sub> and spinel LiMn<sub>2</sub>O<sub>4</sub> are the most widely studied as 4V cathode material. Among these, lithium Manganese oxide spinel has been extensively investigated as cathode materials for lithium secondary battery because of its low cost, easy preparation and environmental advantages. Much work has been directed to the stabilization of the spinel structure upon cycling. In previous reports, Amatucci et al.[1] has proposed a surface treatment by using organic and inorganic compounds to decrease reactivity of interface between electrode and electrolyte. Recently metal oxide coated LiCoO<sub>2</sub> cathode has been to exhibit relatively good capacity retention without decrease in the original capacity.

Hunter[2] postulated that the redox-type reaction occurs predominantly for the spinel. This mechanism is based on a surface disproportional reaction of the two trivalent ion(Mn<sup>3+</sup>) soluble in the acid solution under low pH conditions and the Mn<sup>4+</sup> ions remain in the lattice, forming MnO<sub>2</sub>.  
$$2\text{Mn}^{3+} \rightarrow \text{Mn}^{2+} + \text{Mn}^{4+}$$

Therefore, It is quite possible that spinel treated with acidic sol solution comprise new surface after heat treatment. We investigated electrochemical characteristics and structural properties of spinel coated with Al<sub>2</sub>O<sub>3</sub>.

Al<sub>2</sub>O<sub>3</sub> coated-LiMn<sub>2</sub>O<sub>4</sub> is prepared by using sol-gel method. AA analysis showed that comparing to bare powder, manganese and lithium dissolution were occurred during the coating treatment. XRD patterns shows that increase in the lattice parameter of Al<sub>2</sub>O<sub>3</sub> coated-LiMn<sub>2</sub>O<sub>4</sub> is related to formation of solid solution formed on the surface of active materials. The cell performance was enhanced with Al<sub>2</sub>O<sub>3</sub> coating.

[1] G.G. Amatucci, A. Blyr, C. Sigala, P. Alfonse, J.M. Tarascon, *Solid State Ionics*, 104, 13(1997)

[2] J. C. Hunter, *J. Solid State Chem.* 39, 2859(1991)