

## Structural and optical properties of $\text{Li}_x\text{T}_y\text{Mn}_{2-y}\text{O}_4$ (T = Fe and Ni) thin films grown by sol-gel method

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Using sol-gel method employing spin-coating process,  $\text{Li}_x\text{T}_y\text{Mn}_{2-y}\text{O}_4$  ( $x = 1$  and  $1.5$ , T = Fe and Ni) thin films were grown on  $\text{Al}_2\text{O}_3(0001)$  substrates. By Fe doping, cubic  $\text{LiFe}_y\text{Mn}_{2-y}\text{O}_4$  films were produced without any second phase up to  $y = 0.9$ . For  $\text{LiNi}_y\text{Mn}_{2-y}\text{O}_4$ , cubic structure is maintained for  $y \leq 0.4$  but the films exhibit tetragonal structure for higher  $y$ . The observed decrease of the lattice constant in the  $\text{LiFe}_y\text{Mn}_{2-y}\text{O}_4$  films indicates that  $\text{Fe}^{3+}$  ions occupy the octahedral sites mostly. On the other hand, both  $\text{Ni}^{3+}$  and  $\text{Ni}^{4+}$  ions occupy the octahedral sites in the  $\text{LiNi}_y\text{Mn}_{2-y}\text{O}_4$  films. Optical properties of the films were investigated by spectroscopic ellipsometry in the visible-ultraviolet range. Observed optical absorption structures are interpreted in terms of charge-transfer and crystal-field transitions involving octahedral  $\text{Mn}^{3+}$  ions.