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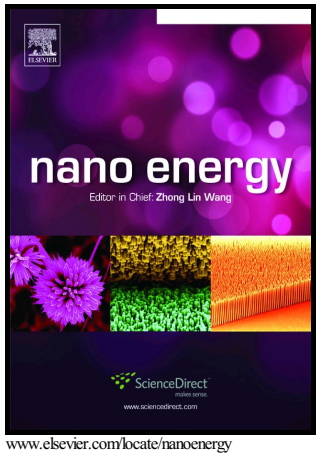


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# $LiNi_{0.5}Mn_{0.3}Co_{0.2}O_2$/Au nanocomposite thin film cathode with enhanced electrochemical properties

Zhimin Qi[1], Jie Jian[1], Jijie Huang[1], Jialiang Tang[2], Han Wang[1], Vilas G. Pol[2], Haiyan Wang[1*]

[1] School of Materials Engineering, Purdue University, West Lafayette, Indiana 47907-2045, United States

[2] Davidson School of Chemical Engineering, Purdue University, West Lafayette, Indiana 47907-2045, United States

hwang00@purdue.edu

**Abstract**

$Li(Ni_xMn_yCo_{1-x-y})O_2$ (NMC) is considered as one of the most promising cathode materials for Li-ion batteries. Highly textured $LiNi_{0.5}Mn_{0.3}Co_{0.2}O_2$ (NMC532) thin films with well dispersed Au nanoparticles (~5 nm in average diameter) were deposited by pulsed laser deposition. Microstructure studies reveal the epitaxial nature of the Au nanoparticles and NMC matrix, and their lattice matching relationships. The Au nanoparticles are uniformly distributed and form faceted interfaces with NMC matrix. NMC with 2 at.% Au shows the highest volumetric capacity, best initial columbic efficiency, highest cycling performance, best rate capability and highest capacity retention among all the samples, due to alteration of chemical environment of transition metal while keeping high crystallinity. Moreover, the electrochemical impedance spectroscopy shows that the incorporation of the Au nanoparticles also reduces charge transfer resistance compared to the pure NMC. The results suggest that appropriate Au