

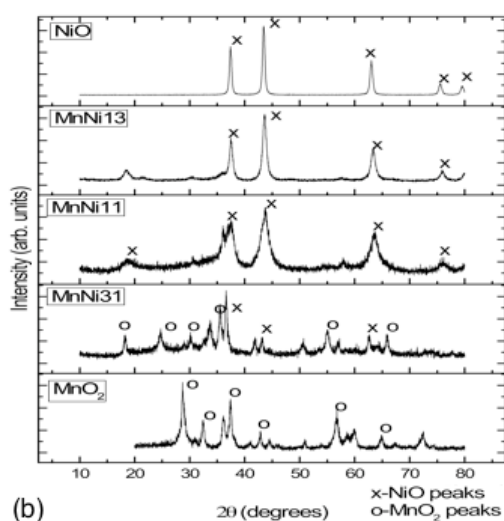
Structural Studies of MnO<sub>2</sub>-NiO Nano Materials  
Synthesized by Reverse Micelle Process

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The reverse micelle method is a distribution of two immiscible liquids facilitated by surfactants. The surfactants reduce the surface tension between the two immiscible liquids. In the oil phase, the surfactants arrange themselves around the droplets of water. The spherical droplets act as nanoreactor vessels to form oxide nanoparticles<sup>3</sup>. Reverse micelle is used to produce uniform nanoparticles, with the greatest disadvantage being a small-scale synthesis.

The reverse micelle method was initiated by a microemulsion mixture of 14 g of n-octane, 3 g of 1-butanol, and 4 g of CTAB with 0.48 M of metal oxides. A second microemulsion was made with 0.48 M of sodium hydroxide. Both microemulsions were mixed using a magnetic stirrer for 1 h. To separate the particles, the resulting microemulsion was centrifuged at 10,000 rpm for 15 min. The particles were washed twice with ethanol and twice with DI water. The particles were dried in the oven at 110 °C for 18 h. The dried particles were ground and annealed at 500 °C for 15 min. TGA measurements of the lithium free manganese-nickel oxides from the reverse micelle method were performed.

X-ray diffraction (XRD) of the cathode materials were collected on a Scintag X-ray diffractometer with a Cu- $\alpha$  between 2 $\theta$  values of 5-125° at the scan rate of 1.00°/min. The XRD patterns were determined by using the *Jade* program and Rietveld refinement was done on the software *Fullprof*. The Zeiss Merlin VP scanning electron microscopy (SEM) was used to determine the morphology of the powders. The Varian 715-ES Inductively coupled plasma (ICP) was conducted on the final products determine the elemental composition of the nanoparticles.



The presence of both layered and spinel structures in the cathode material were confirmed by the XRD pattern. Further results from ICP and SEM, TEM studies will be presented in detail during the presentation. The reverse micelle process facilitated the synthesis of uniform nano structured cathode materials.