DOE STI Product/Report Number	DOE-ER15250-8
DOE Award Number	DE-FG03-01ER15250
STI Product Title	Conducting Polymer-Inorganic Nanoparticle (CPIN) Nanoarrays for Battery Applications - Final Technical Report
STI Product Type and Reporting Period	Final Technical Report 09/01/2001-10/31/2005
OSTI Deliverable Code	AD - Final Report
Date of Issuance or Publication	6/2006
Author	Daniel A. Buttry (buttry@uwyo.edu)
Originating Research Organization	University of Wyoming Dept. of Chemistry (3838) 1000 E. University Ave. Laramie, WY 82071
Sponsoring Organization	PREPARED FOR THE UNITED STATES DEPARTMENT OF ENERGY OFFICE OF SCIENCE
Information Category	Unclassified Unlimited
Distribution Statement	Approved for public release; further dissemination unlimited.

Our objective was to develop new, self-assembling conducting polymer-inorganic nanoparticle nanoarrays (CPIN nanoarrays) comprised of nanoparticles of inorganic Li^+ insertion compounds that are "wired" together with oligomeric chains of derivatives of polythiophene. Using these nanoarrays, we developed an understanding of the relationship between structure and electrochemical function for nanostructured materials. Such nanoarrays are expected to have extremely high specific energy and specific power for battery applications due to the unique structural characteristics that derive from the nanoarray. Under this award we developed several synthetic approaches to producing manganese dioxide nanoparticles (NPs). We also developed a layer-by-layer approach for immobilizing these NPs so they could be examined electrochemically. We also developed new synthetic procedures for encapsulating manganese dioxide nanoparticles within spheres of polyethylenedioxythiophene (PEDOT), a conducting polymer with excellent charge-discharge stability. These have a unique manganese dioxide core-PEDOT shell structure. We examined the structures of these systems using transmission electron microscopy, various scanning probe microscopies, and electrochemical measurements. Various technical reports have been submitted that describe the work, including conference presentations, publications and patent applications. These reports are available through http://www.osti.gov, the DOE Energy Link System.