Contribution ID: **51** Type: **Poster Presentation**

Synthesis of ZnO Nanostructures via zinc air cell system

Tuesday, 8 July 2014 17:10 (1h 50m)

Abstract content
   (Max 300 words)
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Zinc-air batteries have high specific energy, are environmentally friendly and use low-cost materials. They are considered to be potentially attractive power sources for electronics applications. Zinc oxide (ZnO) is formed as a byproduct in their operation. The present study investigates the feasibility of producing ZnO nanostructures using a zinc-air electrochemical voltage cell. Existing methods of synthesizing such nanostructures are expensive, involve complex chemistry, and require good vacuum and high temperatures. These methods are also generally corrosive and toxic. The electrolyte used in the study is lye or sodium hydroxide (NaOH), for reasons of ready availability. The measured parameters are electrolyte concentration, zinc plate size, open-circuit cell voltage and discharge time into a calibrated load. The experimental has two aspects. First, the output cell voltage as a function of the electrolyte concentration and also the cell-performance at a constant Ohmic load are measured. Second, SEM and XRD techniques are used to characterize the zinc electrode surface for the formation of ZnO as a function of the electrolyte concentration. Conclusions are then drawn by correlating the electrical performance of the cell in the first part versus the surface products formed in the second part. The potential outcomes of the study are twofold. First, a suggested alternative to large scale manufacture of ZnO and secondly, a possible method to optimize the power output of the cell as a function of the surface products formed. In this paper, we present the basic theory and our preliminary results to date. This includes the behavior of cell electrical power output correlated to the concentration of the electrolyte. We also present an estimation of yield, surface effects and actual resulting particle sizes.

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Session Classification: Poster1

Track Classification: Track A - Division for Physics of Condensed Matter and Materials