Dye-Sensitized ZnO fibers from Electro-spinning and Photovoltaic Cells

Ramon Luis Figueroa-Diaz
University of Puerto Rico at Cayey

Dr. Jorge Santiago-Aviles
University of Pennsylvania
Outline

- Introduction and Background
- Goal
- Experimental Setup
- Results
- Discussions and Conclusions
- Future Work
- Acknowledgments
Introduction and Background

• Dye-Sensitized Solar Cells (DSC)
  • Low-Cost Solar Cells based on a photoelectrochemical system.

• Photo-electrochemical System
  • Is a system based on a semiconductor between a photosensitized anode and a cathode, both immerse in an electrolyte.
Semiconductor

- Zinc Oxide
  - ZnO nanostructures exhibit interesting properties including high catalytic efficiency and strong adsorption ability.
  - ZnO can be synthesized using the electrospinning technique.
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Goal

- The main goal of this research is to develop a methodology to produce zinc oxide fibers from the electrospinning technique.
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Experimental Setup

- Prepare a solution 33% wt/wt of Zinc Acetate in water.
- Add a solution 20% wt/wt of Poly(vinyl alcohol) in water.
- Heat at 80°C and stir overnight.
- Use the electrospinning technique.
- Heat the fibers at 650°C for 6 hours.
- Characterize the fibers.
Preliminary results

- After performing the electrospinning technique, we did not obtained fibers.
What happened?

- For the voltage that can be used in our setup, the solvent were not able to vaporize through the procedure.
Changes

- Prepare a solution 19\% \text{wt/wt} of Zinc Acetate in water.
- Add a solution 13\% \text{wt/wt} of Poly(ethylene oxide) in anhydrous ether.
- Stir overnight.
- Use the electrospinning technique.
- Heat the fibers at 650^\text{oC} for 6 hours.
- Use characterization techniques.
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Results

SEM photos of the unheated fibers
Optical Microscope photos of the heated fibers
SEM photos of the heated fibers
Characterization

Raman Spectrum of ZnO Fibers
Discussions and Conclusions

- With the methodology developed, fibers were made.
- With the characterization we can say that the composition of the fibers is indeed zinc oxide.
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Future Work

- For the DSC, the semiconductor needs a certain alienation and methodology to obtain the fibers aligned must be developed.
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