

Characterization and improvement of p-type dye sensitized solar cells.

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We present recent research that has been done in our group detailing the mechanism of a p-type cell. A p-type electrode will eventually be used as the cathode electrode in a tandem cell, in order to achieve that the performance of the cell has to be improved.

In our group we working with NiO as a p type semiconductor the properties of which has yet to be fully understand. The surface chemistry studies which consist of solid state UV, electrochemistry and sun simulation measurements will reveal the reason why a p-type cell is not achieving his theoretical values and what are the change that has to be made to in order to do so.

Design and synthesis of the dye is a strong asset, as well, in the performance of the solar cell. When designing a dye for a p-type solar cell it should be taken into account that the HOMO of the dye should be situated at his anchoring ligand. Cyclometalated Ru dyes have been developed in our group a long time now. Those dyes are consisted of Ru-metal center bipyridine as ancillary ligand and a phosphoric or carboxylic acid as an anchoring ligand. A dye with these characteristics has been synthesized in our group. The performance of which, in a solar cell exceeds most of known p-type dyes.

Moreover, the electrolyte used as an ion carrier in the solar cells should be examined closely. The redox potential of the electrolyte should be conform with the valence band of the semiconductor in order to achieve the highest open circuit voltage.

Until recently iodine triiodide electrolyte has been used in p-type regardless the fact that is an n-type optimized electrolyte. Cobalt dimethylamine electrolyte has been found to be much more suitable for p-type solar cells according to their redox potential. In our group research to improve the electrolyte performance by changing the ancillary ligands is been held.

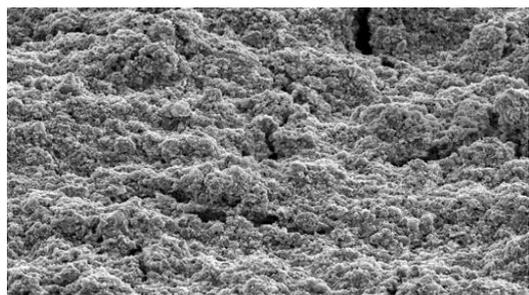


Fig. 1: SEM image of NiO semiconductor.