

Summer Research Program 2011/2012

Project Title *Light enhanced Hydrogen production on conducting polymer composites*

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Objective

We have recently reported that the conducting polymer poly(3,4-dioxy-thiophene) (PEDOT) is an excellent electro-catalyst for reduction of oxygen required in the air-electrode in both fuel-cells and metal-air batteries and for reduction of protons from acidic aqueous electrolytes. We are now searching for routes to incorporate light harvesting materials into the conducting polymers to facilitate the electrode reaction to be driven or enhanced by (sun)light. Preliminary work in our group has developed methods to produce blends of conducting polymers and organic molecules as well as composites of conducting polymers and inorganic materials. In both cases composites with combined properties has been the result and these are seen as the basis for possible candidates for the proposed project.



PEDOT based air-electrode

The Project

Composites of conducting polymers (especially PEDOT) and organic light-harvesting molecules will be the main materials for this project. Vapour phase polymerisation (VPP) of PEDOT using iron(III) salts as oxidant will be the technique used for producing conducting polymer coated electrodes. A main part of the project will be to select and try candidate light-harvesting molecules based on band-gap consideration and the possibility to exchange charges with the conducting polymer. The incorporation of organic molecules can be obtained a number of ways depending on the nature of the molecules in question.

The characterisation of the materials will be a combination of electro-catalytic testing of the electrodes in aqueous electrolytes, measuring the hydrogen production, with more traditional electrochemical techniques, UV-vis-NIR, FTIR and Raman spectroscopy, SEM and TEM imaging.

Good lab skills are required especially in the area of electro-chemistry.