**Application of Electrochemical Methods in Artificial Photosynthesis**

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Conversion of solar energy into transportable liquid fuels has been an important research theme in physical sciences for the last decade. Many artificial photosynthetic devices have been built with numerous iterations and enhancements, yet all fall short of the biological machinery. In the current presentation, two major problems in artificial photosynthesis will be discussed: 1) limited lifetime of the photo-absorber due to oxidative degradation and 2) deficient understanding of the complex oxygen evolution reaction (OER). In the first part of the presentation, a proof-of-concept photo-anodic device for OER will be demonstrated. Prolonged use of corrosion sensitive n-type silicon was made possible in water by application of an electrodeposited thin passivating layer of TiO2. A rare metal/insulation/semiconductor junction was employed for solution electrochemistry; insights into the tunneling electron transfer phenomenon involved in solution chemistry will be presented. In the second part of the talk, an investigation of the catalytic OER surface processes will be presented. By use of a redox titration experiment, the redox processes occurring at the surface of metal oxides during OER were investigated.