

# ENFL: Division of Energy and Fuels

## 206 - Energy applications of (photo)electrochemically prepared organic/inorganic hybrid semiconductor assemblies

[View Session Detail](#)

**Author Block:** Csaba Janaky<sup>1</sup>, Dorottya Hursan<sup>3</sup>, Gergely Samu<sup>3</sup>, Csaba Visy<sup>3</sup>, Krishnan Rajeshwar<sup>2</sup>

<sup>1</sup> Department of Phys. Chem. Mater. Sci., University of Szeged, Szeged, Hungary; <sup>2</sup> UT Arlington, Arlington, Texas, United States; <sup>3</sup> University of Szeged, Szeged, Hungary; <sup>3</sup> University of Szeged, Szeged, Hungary; <sup>3</sup> University of Szeged, Szeged, Hungary

**Abstract:** Hybrid materials based on organic conjugated polymers and inorganic nanostructures have been at the leading edge of research and development. Hybridization of metal oxide semiconductors with conducting polymers is particularly interesting, since a wide range of properties can be combined with the properties of the polymer. TiO<sub>2</sub>, ZnO, WO<sub>3</sub>, Fe<sub>3</sub>O<sub>4</sub>, V<sub>2</sub>O<sub>5</sub>, MoO<sub>3</sub> etc. are often combined with different polymers (most importantly with thiophene-derivatives, polypyrrole, and polyaniline). Such hybrid assemblies are promising candidates for utilization in various energy related applications such as solar cells, (photo)-electrocatalysts, supercapacitors and Li-ion batteries.

As summarized in our recent review article, photo(electrodeposition) can be a particularly powerful tool for the in situ polymerization on a nanostructured electrode. In principle, the intrinsic electroactivity of the monomers can be exploited to electropolymerize them on an inorganic semiconductor as the working electrode substrate. In this paper we present various examples of hybrid materials based on TiO<sub>2</sub> nanotubes and nanoporous WO<sub>3</sub>, in combination with conjugated polymers as PEDOT, polyaniline and polypyrrole. Galvanostatic, potentiostatic and potentiodynamic growth methods will be presented. The limitations of such procedures will be emphasized and generalized solutions will be given to overcome the difficulties arising from the limited conductivity of the nanostructured working electrodes.

Finally, selected examples from our laboratories will be presented, on how these hybrid assemblies can be used in (i) solar cells, (ii) photoelectrochemical reduction of CO<sub>2</sub>.

|                      |                          |                             |                        |                         |
|----------------------|--------------------------|-----------------------------|------------------------|-------------------------|
| <a href="#">Home</a> | <a href="#">Schedule</a> | <a href="#">Floor Plans</a> | <a href="#">Search</a> | <a href="#">More ..</a> |
|----------------------|--------------------------|-----------------------------|------------------------|-------------------------|

