

SEKTIONEN FOR UORGANISK KEMI  
KEMISK FORENING  
Universitetsparken 5  
DK-2100 København Ø

## SUK-MØDE

Torsdag den 28. oktober 2004, kl. 17.30  
i auditorium 10, H.C.Ørsted Institutet

**Matteo Biancardo**  
**Risø National Laboratory – Danish Polymer Centre**

will talk on

### **Electrochromic and Photochromic Devices Based on Wide Band-Gap Nanocrystalline Semiconductors Functionalized with Polynuclear Mixed Valence Compounds**

The general concept of using polynuclear mixed-valence (MV) compounds anchored to nanocrystalline wide band-gap semiconductors for their use as electrochromic and photochromic devices is introduced. This idea is applied to control the domain of the electro-induced spectral changes in the whole visible and near infrared regions.

Numerous binuclear, and more in general polynuclear, MV compounds based on transition metal ions have been reported since the synthesis of the Creutz ion  $[\text{Ru}^{\text{II}}(\text{NH}_3)_5\text{pzRu}^{\text{III}}(\text{NH}_3)_5]^{5+}$ . The peculiar property of this polynuclear species, relevant for their application in electrochromic devices, is related to the presence of metal-to-metal absorption bands in the visible and near-infrared spectral regions. These bands, which are also known as intervalence transfer bands, are due to optical electron transfer transitions involving bridged metal centers.

Adsorption of polynuclear MV compounds on transparent nanocrystalline  $\text{SnO}_2$  or  $\text{TiO}_2$  films, deposited on conductive glass, results in electrochromic devices where the electronic transitions, localized on the metal sub-units and the electronic transitions between the metal centers, can be controlled by the applied potential. Modulation of the transmitted light over the whole visible and NIR spectral regions can be obtained by synthetic design of the polynuclear species.

Combination of polynuclear MV compounds and of suitable molecular sensitizers (S) on the surface of nanocrystalline  $\text{TiO}_2$  films gives rise to assemblies undergoing photoinduced electron transfer between  $\text{S}^*$  and MV to form the charge separated products  $\text{S}^+$ ,  $\text{MV}^-$ . The electron transfer process is mediated by the semiconductor conduction band and leads to a long lived charge separated state  $\text{S}^+/\text{MV}^-$ . Time Resolved Absorption Spectroscopy suggests an oxygen-mediated charge recombination.

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Efter mødet er der spising. Pris: 40,- pro persona, studerende: 20,- pro persona  
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