Università di Roma
Tor Vergata

**Università degli Studi di Roma "Tor Vergata"**

**Dipartimento di Scienze e Tecnologie Chimiche**
Via della Ricerca Scientifica, 1 - 00133 Roma (IT) - Tel +39 06 72594337 Fax +39 06 72594328

# AVVISO DI SEMINARI

Il giorno 30/05/2018 alle ore 11:30
nell'Aula Seminari del Dipartimento di Scienze e Tecnologie Chimiche

**Prof.ssa Kwang Leong Choy**
**and**
**Dr Mingqing Wang**

**Institute for Materials Discovery,**
**University College of London,**
**London, WC1E 7JE, United Kingdom**

***Terranno due seminari dal titolo:***

**"Materials and Process Innovations for Functional and Biomedical applications"**

**and**

**"Non-vacuum Processed Thin Film Semiconductors for Solar Energy Harvesting and Storage"**

*Proponente: Prof. Danila Moscone*

Università di Roma
Tor Vergata

# Università degli Studi di Roma "Tor Vergata"

**Dipartimento di Scienze e Tecnologie Chimiche**
Via della Ricerca Scientifica, 1 - 00133 Roma (IT) - Tel +39 06 72594337 Fax +39 06 72594328

## Materials and Process Innovations for Functional and Biomedical applications
**Prof. Kwang Leong Choy**

This contribution gives an overview on the design and discovery of novel multifunctional nanostructured materials and nanocomposite coatings. Innovative, scalable and eco-friendly non-vacuum based chemical vapour deposition (CVD) based methods have been developed for the fabrication of such nanomaterials and multifunctional films. The deposition mechanism and process controls will be discussed for the fabrication of such materials with well controlled structure and composition at molecular level. The effects of the deposition process on the structure and properties of the nanostructured materials will be presented. The use of the nanostructured materials for functional, healthcare and biomedical applications will be highlighted.

## Non-vacuum Processed Thin Film Semiconductors for Solar Energy Harvesting and Storage
**Dr Mingqing Wang**

Solar cells are considered as one of the important energy for low carbon future to solve the growing energy crisis and environment pollution problem. The extensive installation of solar cells is currently limited by high cost manufacture process. In our group, a novel and non-vacuum Electrostatic Spray Assisted Vapour Deposition (ESAVD) process has been developed to deposit CIGS and CZTS absorber layers for thin film solar cells. ESAVD is a scalable process for industrial level and it can be operated in open atmosphere. After optimization of the composition of precursor, selenization condition, and Mo/absorber interface, the best efficiency of CIGS and CZTS solar cells approaches 11% and 7%, respectively. Fully non-vacuum processed CIGS solar cells using electrodeposited absorber and Ag nanowires based transparent TCO has reached efficiency above 14%.

Due to the intermittence properties of solar energy, the electricity produced at daytime must be stored for the high-demand usage at night. Photoelectrochemistry is one of the promising ways to convert solar energy into storable hydrogen fuel. ESAVD deposited Cu(In,Ga)SSe (CIGS) thin films was used as photocathodes, combined with the earth abundant cobalt sulfide (Co–S) as a catalyst to accelerate the kinetics of photogenerated electron transfer and hydrogen generation for photoelectrochemical water splitting. Both the photocurrent densities and the onset potentials of the photocathodes were significantly improved by the electrodeposition of the low cost and earth-abundant Co–S catalyst, with a photocurrent density as high as 19.1 mA $cm^{-2}$ at −0.34 V vs. reversible hydrogen electrode (RHE), comparable with and even higher than that of the control photocathode using rare and precious Pt as a catalyst.