



Dziekan Wydziału  
Matematyczno-Przyrodniczego  
i Dyrektor Instytut Fizyki  
Akademii Jana Długosza  
w Częstochowie zapraszają  
**27 lutego 2013 r. o godz. 12<sup>15</sup>**  
**do Audytorium – sala 1023**  
**Akademii Jana Długosza w**  
**Częstochowie**  
Al. Armii Krajowej 13/15



na

## Seminarium Wydziału Matematyczno-Przyrodniczego

na którym

**Prof.dr.hab. Abdel Hadi Kassiba**

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przedstawi wykład:

## **Titanium Oxide based Nanoparticles, Mesoporous structures and Photoactive Gels: Structural, Electronic and Photoinduced processes**

Titanium oxide films, mesoporous structures, nanoparticles or gels media have been subject of a great scientific activity with regard to their versatile electronic, optical or catalysis properties. The interest is motivated, notably, by the promising applications in processes such as photocatalysis, smart sensors or for solar cells technologies. For these classes of materials, doping by suitable elements modulate drastically the electronic and optical properties. This is mainly due to the allowed electronic states which can be created inside the band gap of the pure samples. It is well known that the doping process leads to electronic centres which can exhibit paramagnetic nature able to be easily characterized by EPR spectroscopy. Beyond to identify the nature of the active centres, EPR allows determining the local environments of doping agents, their electronic, optical and magnetic properties. On the other hand, the microstructure of the samples plays a key role in the stability of the paramagnetic centres. Thus, comparative investigations performed on nanoparticles and mesoporous materials inform on the efficiency of the doping process, on the concentration and nature of the involved oxygen based radicals and vacancies. The large specific surfaces of these nanostructured systems enhance the concentration of oxygen or nitroxide based radicals and contribute to lower the doping efficiency. For the titanium oxide based gels, quite different behaviors of paramagnetic centres were pointed out. These media are model systems to characterize the phenomena of the UV-photoinduced charge transfer on titanium ions. EPR technique was also used to probe the kinetic of the electron-hole creation as well as the chemical environments of  $Ti^{3+}$  ions. A discussion will be made on the relevance of these titanium based oxide mesostructures in solar cell technology with respect to traditional dye sensitized solar cells. (Abdel Hadi Kassiba)

### Recent References

\* Hussein Melhem, Pardis Simon, Jin Wang, Catherine Di Bin, Bernard Ratier, Yann Leconte, Nathalie Herlin-Boime, Małgorzata Makowska-Janusik, Abdelhadi Kassiba, Johann Bouclé *Solar Energy Materials & Solar Cells*, accepted for publication (2012), doi:10.1016/j.solmat.2012.08.017, \* P. Mei, M. Henderson, A. Kassiba, et al., *J. Phys. Chem. Solids*, 71,1 (2010)1, \* B.Pattier, M. Henderson; A. Poepl; A. Kassiba,et al., *J. Phys. Chem.B*, 114, 13 (2010) 4424, \* A. Kassiba, B. Pettier, M. Henderson, M. Makowska-Janusik, P. Mei, A. Gibaud, *Mat. Sc. Eng B*, 177, 6 (2012) 1446

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Sekretarz Seminarium