



# Fall 2008 Environmental Engineering seminar series



Presenting :

**German Telbiz, Ph.D., Professor**

Institute of Physical Chemistry  
National Academy of Sciences of Ukraine

## Sol-gel route for preparation of mesoporous films: Nanotechnology for improved composite membranes

All Students, Faculty, and Staff are welcome

### **Abstract**

With nanotechnology it is possible to create materials from building blocks the size of atom clusters, which exhibit enhanced electronic, magnetic, optical and chemical properties. There are various widely known methods to produce nanomaterials. Sol-gel synthesis is a technique well suited for coating large surface areas with very well defined nanoscale compounds. This presentation will be focused on a different approach to the preparation of mesoporous  $\text{TiO}_2$  and  $\text{SiO}_2$  thin films and nanocomposites, namely the preparation of oriented films with highly stable roughness, hydrophobicity of the film surface and controlled pore dimension. The latter property is of utmost importance for the above mentioned materials for separations of environmental contaminants and enhanced environmental measurements such as photocatalytic degradation of organic compound. The route of preparing mesostructured films with various characteristics will be shown. The preparation and compositional analysis of thin film coatings prepared using sol-gel techniques (thickness 30-500 nm, roughness  $\pm 0, 5$  nm with pore distribution 2,4 - 8 nm for silica oxide and up to 300 nm for titanium oxide). Moreover we have evaluated their possible applications as matrices for various nanostructures (semiconductor, polymer, gold and silver nanocluster) such as sensing membranes for chemical sensor devices: in fact, a control of pores dimension can enhance their selectivity to gas molecules that can be adsorbed on silica and titanium oxide films. Development of physical and chemical principles and experimental methods of creation of nanocomposites with various functionalities based on silica and titanium dioxides with the gold and silver nanostructures, dyes as guests will be described. Supported mesoporous membranes based on such nanocomposite films offer potential applications in the nanofiltration process.

**Tuesday, October 21, 2008**

**9:10– 10:00am**

**2243 Engineering Building**

**Refreshments Provided**

*Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Accommodations for persons with disabilities may be requested by contacting Dr. Volodymyr Tarabara ([tarabara@egr.msu.edu](mailto:tarabara@egr.msu.edu)).*