

GDANSK UNIVERSITY OF TECHNOLOGY

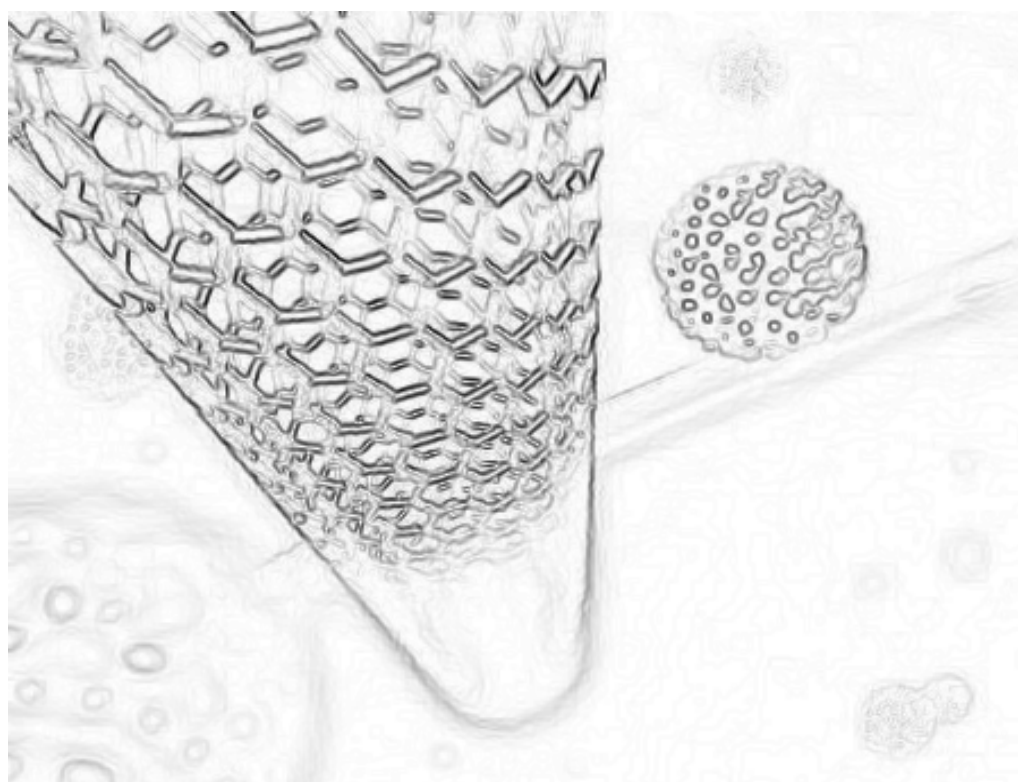


meets



UNIVERSITA' degli studi DELL'AQUILA

Jan. 24th-27th 2012



**PRESENTATION OF RESEARCH AND TEACHING ACTIVITYIES AT
GDANSK UNIVERSITY OF TECHNOLOGY (POLAND)
partner of the INTERNATIONAL MASTER DEGREE IN PHYSICS**

*Facoltà di Scienze MM.FF.NN.
Coppito (AQ)*

*All students in master, bachelor and PhD courses in Physics, Chemistry, Material
Science, Engineering are strongly encouraged to attend.*

Meeting schedule

Tue. Jan. 24th 2012 Aula 2.5 Coppito I

14:00-15:45 Prof. M. Gazda: *The Gdansk University of Technology
Advanced Functional Materials: I*

16:00-18:00 Prof. M. Gazda: *Advanced Functional Materials: II*

Wed. Jan. 25th 2012 Aula 0.6 Coppito I

14:00-15:45 Dr. Sz. Winczewski: *Genetic and Evolutionary Algorithms: theory
and applications I*

16:00-18:00 Dr. Sz. Winczewski: *Genetic and Evolutionary Algorithms: theory
and applications II*

Thu. Jan. 26th 2012 Aula 0.6 Coppito I

14:00-15:45 Dr. A. Mielewczyk-Gryn: *Advanced materials for Solid Oxide Fuel Cells I*

16:00-18:00 Dr. A. Mielewczyk-Gryn: *Advanced materials for Solid Oxide Fuel Cells II*

Fri. Jan. 27th 2012 Aula 0.1 Coppito I

9:30-10:45 Dr. B. Bochentyn: *Mixed ionic-electronic conductors I*

11:00-13:30 Dr. B. Bochentyn: *Mixed ionic-electronic conductors II*

**All students in master, bachelor and PhD courses in Physics,
Chemistry, Material Science, Engineering are strongly
encouraged to attend.**

Abstracts

Tue. Jan 24th 2012 2:00-6:00 PM room 2.5 Coppito I

Prof. M. Gazda: Advanced Functional Materials

The lectures consist of the following parts:

1. Introduction: this part is focused on what a functional material is and which materials may be considered advanced.
2. Part two introduces a very popular and commonly used advanced functional material, titanium oxide.
3. Part three gives further examples of interesting materials: perovskites as a very large family of materials, which exhibit diverse properties (e.g. ranging from an insulator to a superconductor).
4. Part four introduces very interesting properties of carbon nanomaterials.
5. Summary: this part describes advanced functional materials prepared and studied at the Gdansk University of Technology.

Wed. Jan 25th 2012 2:00-6:00 PM room 0.6 Coppito I

Dr. S. Winczewski: Genetic and Evolutionary Algorithms and Their Applications

Genetic and evolutionary algorithms are computational methods that mimic natural evolution. Since they constitute efficient techniques for solving complex optimization problems, they are widely used in various computational domains.

The lecture targets people with no previous knowledge of genetic algorithms. After a short introduction (covering the historical and biological background), an extensive explanation of the basic concepts of genetic algorithms will be given. In particular, the canonical genetic algorithm will be discussed in detail to provide the necessary understanding of all essential concepts. Various methods of implementing genetic operators will be presented. Finally, potential applications (together with illustrative examples) will be discussed. The lecture will also focus on schema theory, which constitutes the first historical foundation for the explanation of the power of genetic algorithms.

Thu. Jan 26th 2012 2:00-6:00 PM room 0.6 Coppito I

Dr. O. Mielewczyk-Gryn: Advanced Materials for Solid Oxide Fuel Cells

Solid oxide fuel cells (SOFCs) are a group of devices used in energy conversion, whose development seems crucial in today's world in order to satisfy the constantly growing demand for new energy sources. SOFCs directly convert the chemical energy of hydrogen into electricity. The development of this group of devices is strongly dependent on the development of materials from which they are made. The main parts of an SOFC are interconnectors, an anode, electrolyte and a cathode. Each of these components is characterized by different demands and different features must be enhanced. This lecture will be mainly focused on materials used in the construction of SOFCs, the demand for these materials and an up-to-date solution of the problems of SOFC technology.

Fri. Jan 27th 2012 9:30-13:30 room 0.1 Coppito I

Dr. M. Bochentyn: Mixed ionic-electronic composite materials: properties and various methods of their investigation

In recent years, mixed ionic-electronic conductors (MIECs) based on composites have been widely used in solid-state ionic devices, such as batteries, fuel cells, chemical sensors, as well as in electrochemical processes, such as electrosynthesis and gas separation. The greatest advantage of a composite MIEC over a homogeneous single-phase MIEC is that the transport properties of a composite can be readily tailored to a particular application.

The influence of preparation conditions on the properties of composites will be analyzed. In order to characterize these materials, various experimental methods can be applied. Here, the XRD, SEM, EDX, AFM, and TGA techniques for microstructural characterization will be described. For electrical measurements, 4-wire DC, Van Der Pauw and IS methods will be mentioned. Dilatometry and nanoindentation will be considered as techniques for the characterization of mechanical properties.