

# CONTENTS

## Metalurgia International Special Issue 2008

ISSN 1582-2214



### CONFERENCE

#### EXPLORING ROMANIAN RESOURCES IN MATERIALS RESEARCH

#### July 7 - 8 2008 - Brasov



- SAMOILA CORNEL, URSUTIU DORU, STRUL MOISA:* TiC functionally graded materials obtained with powder metallurgy technology ..... 5
- ENIKÖ VOLCEANOV, GEORGETA PREDEANU:* Advanced ecoceramic materials ..... 11
- LUMINITA MARIN, ELENA PERJU:* New polymer-dispersed liquid crystals. Preparation and thermal characterization ..... 17
- G. TELIPAN, PASLARU-DANESCU L., RACLES C.:* Sensor and apparatus for CO<sub>2</sub> detector with organo-siloxane supramolecular polymers sensitive layer ..... 22
- VIORICA MUŞAT:* Sol-gel ZnO-based thin films as key multifunctional materials for advanced technological applications ..... 29
- ANDREI G., CIRCIUMARU A., DIMA D., BIRSAN I.G., ANDREI L.:* Electrical behavior of carbon based polymer composite ..... 36
- PĂUN VIOREL-PUIU:* An explicit calculus formula of the polymers flux through nanometer size pores ..... 43
- ANGHEL DRAGOŞ-VICTOR:* Anisotropic interaction of two-level systems with elastic waves in disordered crystals ..... 49

### DATA BASES

- E According to paragraph 2.6 of license agreement between EBSCO Publishing Inc. (U.S.A.) and FUNDATIA METALURGIA ROMÂNĂ (ROMÂNIA) the journals METALURGIA and METALURGIA INTERNATIONAL are included in EP Products, starting from July 1<sup>st</sup>, 2006.
- E These journals are included on EBSCO's site: [www.ebscohost.com](http://www.ebscohost.com), chapter „Computers and Applied Sciences Complete”, positions 1026 and 1027.
- E Starting from January 1<sup>st</sup>, 2007 the journal METALURGIA INTERNATIONAL is also in the SCOPUS database, belonging to ELSEVIER BIBLIOGRAPHIC DATABASES – Amsterdam (Netherlands).
- E We inform our authors and readers that now our magazine “METALURGIA INTERNATIONAL” is introduced in THOMSON SCIENTIFIC MASTER JOURNAL LIST, letter M, position 400. For next information please access [www.isinet.com](http://www.isinet.com) position <http://scientific.thomson.com/cgi-bin/jrnlst/jlresults.cgi>
- METALURGIA INTERNATIONAL is evaluated by Romanian Council for Research and Development in Universities into category “A” (see CNCIS Website).
- E The publisher is honoured to inform the readers and authors that beginning with volume 12 (2007), METALURGIA INTERNATIONAL is indexed and abstracted in the following:
- Science Citation Index Expanded (also known as Sci Search\*)
  - Journal Citation Reports/Science Edition
- These elements represent Thomson Reuters products and custom information services.
- E THE BRITISH LIBRARY – Londra (Anglia), starting from year 2008

- 
1. The “METALURGIA INTERNATIONAL” magazine receives manuscripts of papers including basic scientific research and industrial research in the following fields: metallurgy, materials science and engineering and different relating processes.
  2. Original papers not previously publishing in any other journal, or not sent for publishing before, are accepted.
  3. After publication, the copyright is transferred to the publishing house.
  4. Every manuscript will be referred, their reports form the basis of the Editor's decision.
  5. The manuscripts sent to the Editor will not returned to the author, even they are not published.
  6. The manuscripts will be sent to the following address:  
METALURGIA INTERNATIONAL  
83, Calea Grivitei, sector 1, Postal code 010705, postal office 12  
Bucharest, Romania  
Tel.: +(40)-021-310 71 38; +(40)-021-0722 665 071;  
Fax: +(40)-021-310 71 38  
E-mail: [redactia@metalurgia.ro](mailto:redactia@metalurgia.ro); See also web: [www.metalurgia.ro](http://www.metalurgia.ro)

REDACTION

# ABSTRACT

Metalurgia International Special Issue 2008

ISSN 1582-2214



## CONFERENCE EXPLORING ROMANIAN RESOURCES IN MATERIALS RESEARCH

July 7 - 8 2008 - Brasov



**D.C.: 621.762**

**SAMOILA CORNEL, URSUTIU DORU, STRUL MOISA:**  
**TiC functionally graded materials obtained with powder metallurgy technology**

Metalurgia International (vol. XIII) Special Issue 2008 p. 5

The paper has as main topics improvement of the classic technology for Functionally Graded Materials fabrication using new concept regarding cermets fabrication using powder metallurgy technology and infiltration with molten alloys. This new concept are based on the possibility to tailor the final properties in two steps:

- ❖ one using diffusion during sintering process, allowed because the powders contain both nonstoichiometric and stoichiometric composition,
- ❖ and other, using a second controlled diffusion allowed by the infiltrated alloy and thermodynamics between cermets and alloy.

This new concept was experimented and confirmed in the frame of one PhD thesis in Transilvania University of Brasov. At the end of the fabrication cycle will be tailored new composite material with high hardness on one surface followed by graded mechanical properties on cross-section up to high toughness on the opposite surface. These tailored properties will ensure, as expected results, high resistance at bullet shock, on the one hand, and high capacity of absorption of the energy of shock, on the other hand when the research are oriented on the bullet-waistcoat fabrication. In fact the new material have the quality to be extended at other several applications both for military production and for civilian ones.

**D.C.: 666.3**

**Key words:** ecoceramics, wood waste, pyrolised fossile wood, silicon carbide, sintering  
**ENIKŌ VOLCEANOV, GEORGETA PREDEANU:**  
**Advanced ecoceramic materials**

Metalurgia International (vol. XIII) Special Issue 2008 p. 11

Environment-Conscious Ceramics (Ecoceramics) are a new class of hybrid materials that can be produced with renewable resources (wood waste, other vegetable wastes). Wood is one of the best and most intricate engineering materials created by nature. Natural woods of various types are available throughout the world. In addition, the development of such kind of materials is supported by the environmental advantage of renewability of the carbonaceous ingredients provided by various sources all over the world, in conjunction with the advantage of the properties tailorability. Environment-conscious ceramic

materials are manufactured by the pyrolysis and infiltration of natural wood or wood derived preforms, with different potential applications. The experimental studies have led to data on the development of materials based on biologically derived structures (fossile woods) and indicated that these materials behave like ceramic materials manufactured by conventional technology. These new ecoceramic structures have shown promising characteristics to be quite useful in producing porous or dense materials having various microstructures and compositions.

**D.C.: 548.**

**Key words:** polymer dispersed liquid crystal system, polysulfone UDEL-1700, optical polarized microscopy  
**LUMINITA MARIN, ELENA PERJU:** **New polymer-dispersed liquid crystals. Preparation and thermal characterization**

Metalurgia International (vol. XIII) Special Issue 2008 p. 17

We report the preparation and thermotropic characterization of a novel polymer dispersed liquid crystal system (PDLC) based on the polysulfone UDEL-1700 as polymer matrix and 4-[4-(n-butyloxi)phenylene-imino-methylidene]benzonitrile (4CB) as liquid crystal. PDLC films have been prepared with different compositions in the two components. A detailed optical polarized microscopy study has been carried out to evaluate a correlation between the composition and PDLC formation.

**D.C.: 678.06**

**Key words:** organo-siloxane supramolecular polymer, FT-IR spectra, differential scanning calorimetry (DSC), gas sensor, thin film technology, CO<sub>2</sub> detector  
**G. TELIPAN, PASLARU-DANESCU L., RACLES C.:** **Sensor and apparatus for CO<sub>2</sub> detector with organo-siloxane supramolecular polymers sensitive layer**

Metalurgia International (vol. XIII) Special Issue 2008 p. 22

The sensor was made by thin film technology. An alumina substrate 5x5x0,6 mm was used. On the substrate was deposited by magnetron sputtering two plates Au electrodes. The sensitive layer the organo-siloxane supramolecular polymers was dissolved in chloroform and was deposited by spin coating on the substrate over electrode in the 200 nm thickness. The sensor was tested in 100 and 1000 ppm concentration CO<sub>2</sub> and the voltage values obtained are 92 mV and 970 mV for 100 ppm and 1000 ppm CO<sub>2</sub>. The apparatus for CO<sub>2</sub> detection is composed by the sensor and electronic device of signal conditioning.

# ABSTRACT

## Metalurgia International Special Issue 2008

ISSN 1582-2214

**D.C.: 621.315.5**

**Key words:** zinc oxide, sol-gel, transparent thin films, transparent conductors, mesoporosity, nanocomposite, UV/ozone sensors, transparent electronics

**VIORICA MUŞAT: Sol-gel ZnO-based thin films as key multifunctional materials for advanced technological applications**

Metalurgia International (vol. XIII) Special Issue 2008 p. 29

*Low cost and environmentally friendly, the transparent ZnO-based thin films are considered as key components in transparent electronics, one of the most advanced topics of our days. The paper presents the microstructure, optical and electrical properties of transparent and conductive Al:ZnO thin films, transparent and resistive ZnO thin films and transparent UV/ozone sensing ZnO:SiO<sub>2</sub> nanocomposite thin films obtained by sol-gel method.*

**D.C.: 678.743**

**Key words:** polymer, carbon, ferrite, nanotube, conductivity, permittivity

**ANDREI G., CIRCIUMARU A., DIMA D., BIRSAN I.G., ANDREI L.: Electrical behavior of carbon based polymer composite**

Metalurgia International (vol. XIII) Special Issue 2008 p. 36

*The paper concerns lightweight carbon based polymer composites for aircraft structures and deals with new material recipes and testing results. A new class of lightweight composites with carbon nanotubes and ferrite particles is analyzed in order to assess the electrical properties. Results concerning electrical properties of a new advanced polymer composite which may be used in aircraft lightweight structures are discussed. Epoxy resin blended with ferrite particles and carbon nanotubes, reinforced with carbon texture, was manufactured under controlled electrostatic and magnetic fields, during polymerization. The direction of the field lines related to the plane of carbon texture was considered. Electrical conductivity, electrical permittivity and magnetic permeability were inferred taking*

*into account ferrite concentration and intensity of electric and magnetic fields.*

**D.C.: 669.018.25**

**Key words:** polymer translocation, polymer flux, nanometer pores

**PĂUN VIOREL-PUIU: An explicit calculus formula of the polymers flux through nanometer size pores**

Metalurgia International (vol. XIII) Special Issue 2008 p. 43

*In this paper the process of charged polymer translocation, driven by an external electric potential, through a nanopore has been studied. Assuming a linear dependency of the friction coefficient on the number of segments  $m$  and a parabolic behavior for the free energy  $F(m)$ , in the presence of an electrical field in the pore, an explicit expression for the flux  $J$  of the polymers through a narrow pore was derived.*

**D.C.: 548.**

**Key words:** glassy properties, two-level systems, heat release

**ANGHEL DRAGOŞ-VICTOR: Anisotropic interaction of two-level systems with elastic waves in disordered crystals**

Metalurgia International (vol. XIII) Special Issue 2008 p. 49

*We discuss the anisotropy of the ultrasound absorption and the time dependence of the heat release in disordered crystals with glassy properties, within a recently introduced model [Phys. Rev.B 75, 64202 (2007)]. The glassy properties are a consequence of the existence in the solid of dynamical defects described as an ensemble of two-level systems (TLS) and of the coupling of these defects with the phonon gas. In the new model we associate a direction in space to each TLS and the coupling of a TLS with an elastic disturbance is done through a 4-dimensional array of coupling constants, which's structure is determined by the symmetries of thy crystal. We compare the results of this model with the ones obtained by the standard tunneling model.*

**ANCS**  
Autoritatea Nationala pentru Cercetare Stiintifica



**RUTGERS**  
UNIVERSITY