



### Editorial

2008 was a successful year for the Virtual Institute of Nanofilms VINF, which collaborated in organizing one major International Conference in Budapest in April, and 2 international workshops on Nanofilms, in Como (Italy) and Nottingham (UK). The organization is now fully operational and starts to implement its activities, such as technical services, participation to European projects, educational program, organization of scientific events and active networking all over Europe. Best wishes for 2009!

*The VINF Management team.*

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## HIGHLIGHTS

### International Workshop on Advanced Nanostructured Surfaces for Industrial Applications - II - Nanoproduction & Applications 2009 University of Cambridge - UK



April 6-7<sup>th</sup>, 2008



You are invited to participate in an international workshop dedicated to advanced functional surfaces. The workshop will take place at Fitzwilliam College, Cambridge and will feature a series of keynote speakers discussing the synthesis, characterization and application of nanomaterials, nanostructured thin films and nanotechnology. We aim at the convergence of leading scientists in academia and industry.

Discussion will focus on advances in both fundamental knowledge and applied aspects of the processing, manufacture and employment of nanostructured functional surfaces.

Presentations will encompass: 1/ *Particle preparation: from precursors to nanoparticles*; 2/ *Surface fabrication and analysis*; 3/ *From fundamentals to applications*.

The conference will be chaired by Prof. Andrew Wheatley, University of Cambridge, Fitzwilliam College Cambridge - CB3 0DG (UK).

Information: <http://www.ch.cam.ac.uk/staff/aew.html>

## DESCRIPTION

The Network of Excellence (FP7) EXCELL will launch in January 2009 its long lasting advanced teaching program called “**European post-graduate training on NanoFilms**”. It is composed of 5 Modules of courses (I: Nanofilms Preparation; II: Nanofilms Characterization; III: Fundamental aspects; IV: Mechanical and Tribological applications; V: Biological applications) and each module will be given in different locations all over Europe (and even in Israel and Russia).

Each module consists in 1-2 weeks of intensive courses. The 5 modules will be offered in a 24 months period. Students can follow 1 to 5 modules and the certificates will be independent for each module. The program is opened to post-graduate EC and non-EC students, and to engineers/researchers from SMEs dealing with issues in NanoFilms. Only 25 places available!

## MODULES I & II

The first 2 modules will start from Sunday January 11th to Sunday January 18th, 2009 in Brussels at Université Libre de Bruxelles (Campus Solbosch, avenue F.D. Roosevelt 50, 1050 Brussels). Each lecture will last 1.5 hours including questions and comments. There will be 4 afternoons of practical demonstrations and one evening of poster session for the participating students. As social event, a visit of the National Museum of Cartoons will be programmed during the week.

## REGISTRATION FEES

Registration fees include the participation to the lectures and experimental sessions, to the social event and to the poster session, coffee breaks and lunches.


- Registration Fees ⇒ 450 €
- Special registration fees for VINF Members ⇒ 250 €

## VINF GRANTS

To promote mobility of students and young scientists, the Virtual Institute of Nano Films offers 3 grants of 2.000 € each to attend the Modules I & II in Brussels. To apply, attends are welcome to submit their CV and a recommendation letter from their supervisor before the 15<sup>th</sup> of December 2008.



## PROGRAM of MODULES I & II

January 2009	Monday 12	Tuesday 13	Wednesday 14	Thursday 15	Friday 16	Saturday 17
9:00-10:30	<p><i>X-Ray diffractometer techniques applied to nanolayers and nanofilms.</i></p> <p>Mengucci P. University delle Marche</p>	<p><i>Preparation, Properties and Characterization of Super- and Ultrahard Materials with Emphasis on Nanocomposites.</i></p> <p>S. Veprek, Technical University of Muncih</p>	<p><i>Measurement of Hardness by Indentation and Ion Beam Techniques for Elemental Analysis of Coatings.</i></p> <p>S. Veprek, Technical University of Muncih</p>	<p><i>PVD Deposition techniques : Magnetron sputtering applications.</i></p> <p>C.Fernandez Instituto de Ciencia de Materiales de Sevilla</p>	<p><i>Industrial applications of magnetron sputtering.</i></p> <p>E.Silberberg, ArcelorMittal Liège Research</p>	<p><i>Electrochemistry of thin coatings.</i></p> <p>L. Nykos, Hungarian Chemical Research Centre</p>
10:30-11:00	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break
11:00-12:30	<p><i>Scanning imaging methods in Nanoscience.</i></p> <p>P. Nagy, Hungarian Chemical Research Centre</p>	<p><i>Plasma modeling and fundamentals.</i></p> <p>J. van der Mullen, Technical University of Muncih</p>	<p><i>Surface modification by atmospheric plasmas.</i></p> <p>F. Reniers, Free University of Brussels</p>	<p><i>PECVD - CVD techniques.</i></p> <p>K.L. Choy, University of Nottingham</p>	<p><i>Carbon based nanowires and nanotubes for coating synthesis</i></p> <p>Prof. Y. Lifshitz, Technion</p>	
12:30-14:00	lunch	lunch	lunch	lunch	lunch	Lunch
14:00-15:30	<p><i>ToF SIMS</i> C. Helliwel, Ion-ToF</p>	Laboratory practice	Poster session	Laboratory practice	Laboratory practice	
15:30-16:00	Coffee break	Coffee break	Coffee break	Coffee break	Coffee break	
16:00-17:30	<p><i>Transmission Electron Microscopy: Contribution to the study of nanostructured materials, last trends.</i></p> <p>T.C.Rojas, Instituto de Ciencia de Materiales de Sevilla</p>	Laboratory practice	Poster session Beers and cheeses	Laboratory practice	Laboratory practice	<p>Visit of the Comic museum In Brussles</p> 

To get more information, please contact  
**Prof. A. Fernandez-Camacho**  
 from **INSTITUTO DE CIENCIA DE MATERIALES DE SEVILLA**  
 (<http://www.icmse.csic.es/>) at [asuncion@icmse.csic.es](mailto:asuncion@icmse.csic.es)

## VINF AS A SOLUTION TO FIND PARTNERSHIP in NATIONAL & EUROPEAN PROJECTS

The Virtual Institute of Nano Films is already actively involved as core partner in one FP6 project (Network of Excellence EXCELL) and one FP7 project (Nanoindent) that started in September 1<sup>st</sup>, 2008.

Its experience in participation to European projects, combined to its networking actions provides a unique way to find rapidly partnerships. The 7th Framework Program NMP (Nanosciences and Nanotechnologies, Materials and New Production Technologies) 2009 call for Collaborative Projects opened on November 19<sup>th</sup>, 2008. Several topics involve nanotechnology devices, surface nanoengineering, nanomaterials and thin films technology, and are directly in the scope of the VINF Members.

*Looking for partnership for the last NMP FP7 calls?  
Please contact the VINF Management team by visiting our  
website [www.VINF.eu](http://www.VINF.eu).*

## VINFJOB OFFERS

**Post-doctoral position offer at the Materials Science Institute in Sevilla**

Call for applications: October 2008.

Length of the contract: Up to three years.

Required skills:

⇒ Physics, Chemistry or Engineering Degree and a finalised PhD.

⇒ Experience in high vacuum PVD deposition technology.

⇒ Preparation and characterization of coatings and thin films.

Language: English.

Main purpose of the contract: Assembly and first tests of a Magnetron Sputtering Deposition Chamber. Preparation and characterization of PVD coatings.

















Send CV and/or questions to: Prof. Asunción Fernández, e-mail: [asuncion@icmse.csic.es](mailto:asuncion@icmse.csic.es).



*Have you some positions available or are you looking for one?  
Please contact the VINF Management team by visiting our  
website [www.VINF.eu](http://www.VINF.eu).*

## VINF Members

The Virtual Institute of Nano Films is composed of **11 Effective members** and **2 Associate members**. The entrance of 3 new Associate Members (Technical University of Munich, University of Namur & NanoFab) is foreseen in the 1<sup>st</sup> of April 2009, date of the annual meeting of the General Assembly. This year, the GA meeting will take place in Cambridge (UK).

MEMBERS		Country
	Cockerill Sambre SA	Belgium
	Universita Politecnica Delle Marche	Italy
	University of Nottingham (EM)	UK
	Université Libre de Bruxelles (EM)	Belgium
	Moscow State Institute of Steel and Alloys	Russia
	Institute of Spectroscopy of the Russian Academy of Science	Russia
	SH Sistemi	Italy
	Technion - Israel Institute of Technology	Israel
	Instituto Cienza Materiales Sevilla*	Spain
	Frankfurt Institute for Advanced Studies at JW Goethe University	Germany
	Chemical Research Center, Hungarian Academy of science	Hungary
	Cambridge University	UK
	Tekniker*	Spain
	Technical University of Munich*	Germany
	NanoFab*	Italy
	Faculté Universitaire Notre Dame de-la Paix*	Belgium

\*Associate Members.

**Interested in joining the Institute VINF?  
Please contact the VINF Management team by visiting our  
website [www.VINF.eu](http://www.VINF.eu).**



Polytechnic University of Marche organized in October 28<sup>th</sup>, 2008 a workshop about “Innovative microscopy techniques for the characterisation of metals”. It was organised in collaboration with “Leica Microsystems” (a company producing optical microscopes, <http://www.leica-microsystems.com>), and was addressed to Universities and industry of the metallurgy sector.



*Workshop participants.*



*Dr. Cecchini*

During the workshop, a presentation with the title: “Potentialities and characterisation of nano-structured coatings: the EXCELL project” was given by Dr. Raimondo Cecchini.

For more information regarding the activities of the mechanical department of University of Marche, please visit the website: <http://www.dipmec.univpm.it/>

## Thermal evolution and mechanical properties of hard Ti-Cr-B-N and Ti-Al-Si-B-N coatings

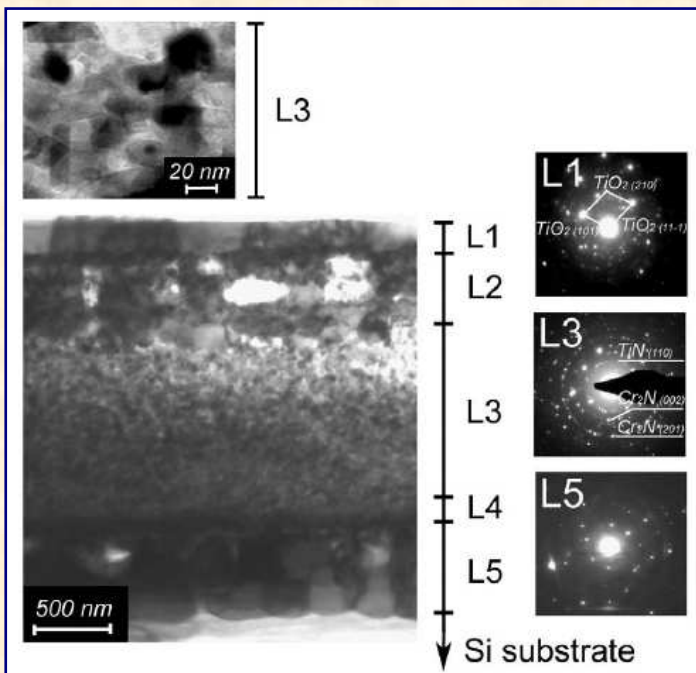
C. Paternoster<sup>a</sup>, A. Fabrizi<sup>a</sup>, R. Cecchini<sup>a</sup>, S. Spigarelli<sup>a</sup>, Ph.V. Kiryukhantsev-Korneev<sup>b</sup>, A. Sheveyko<sup>b</sup>

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Surface properties modification is an effective way to improve the performances of materials subjected to thermo-mechanical stress. Nanocomposite Ti-B-N based coatings have high hardness, while their behaviour at elevated temperatures can be enhanced through the addition of other elements. Indeed, multicomponent materials represent a promising class of protective coatings due to their enhanced mechanical and thermal oxidation properties. Under opportune deposition conditions, phase segregation produces in such materials a nanostructure consisting of small nanocrystals dispersed in an amorphous matrix [1], which provides the coatings with both extremely high hardness and good thermal stability.

Mechanical properties and oxidation behavior of Ti-Cr-B-N and Ti-Al-Si-B-N coatings deposited on single crystal Si (100) by ion implantation assisted magnetron sputtering (IIAMS) in which magnetron sputtering is combined with a Ti ion implantation process, are presented. Microstructure investigation by XRD and TEM, hardness and Young's modulus by in plane and cross sectional nanoindentation, were performed on as-deposited coatings and after annealing in air at 900 °C.



As-deposited Ti-Cr-B-N showed columnar growth with TiN grains of 1-2 nm in diameter, whereas as-deposited Ti-Al-Si-B-N was found to be amorphous. Identical values were found when measuring hardness and Young's modulus along directions parallel and perpendicular to column growth. After annealing, both coatings formed several oxidation layers, with several phases including fcc-TiN phase. Top layers are mainly constituted by TiO<sub>2</sub> and Cr<sub>2</sub>O<sub>3</sub> for Ti-Cr-B-N and by TiO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub> for Ti-Al-Si-B-N. In lower layers fcc-TiN phase is present.



Cross section TEM bright field image of annealed Ti-Cr-B-N/Si, with indication of the different layers (L). SADs recorded from L1, L3 and L5 layers are also reported.

For more information, please contact Prof. S. Spigarelli from Università Politecnica delle Marche ([http://www.dipmec.univpm.it/home\\_uk.htm](http://www.dipmec.univpm.it/home_uk.htm))

## Influence of Si on the structure and properties of multifunctional bioactive nanostructured films

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D.V. Shtansky<sup>a</sup>

<sup>a</sup> State Technological University “Moscow Institute of Steel and Alloys”, Moscow, Russia

<sup>b</sup> Cancer Research Center of RAMS, Moscow, Russia

<sup>c</sup> Institute of Spectroscopy of RAS, Troitsk, Moscow region, Russia

<sup>d</sup> Instituto de Ciencia de Materiales de Sevilla-CSIC/UNSE, Sevilla, Spain

One possible solution to the problem of producing load-bearing implants is to coat a film with multifunctional properties. In this study new ceramic Ti-Ca-Si-C-O(N) films were evaluated as perspective biomaterials for implants. The films were deposited by magnetron sputtering in an Ar atmosphere or reactively in a gaseous mixture of argon and nitrogen ( $\xi=N_2/(N_2+Ar)=0.15$  and 0.25). The films were characterized in terms of their structure, chemical composition, hardness, Young's modulus, elastic recovery, resistance to plastic deformation and long elastic strain to failure, wettability, surface topography, friction coefficient, wear- and corrosion resistance.

The films showed high hardness in the range of 34-39 GPa, reduced Young's modulus 270-322 GPa, and a high percentage of elastic recovery 61%. The films tested in air and under physiological solution (PS) showed low coefficients of friction of about 0.2-0.3 (in air) and 0.4 (under PS), which is lower than 0.45 and 0.75 for Ti substrate and a TiN film under PS, respectively. The films wear rate was within the range of  $(2.3-4.9)\times 10^{-6} \text{ mm}^3\text{N}^{-1}\text{m}^{-1}$  in air and  $(4.9-12)\times 10^{-6} \text{ mm}^3\text{N}^{-1}\text{m}^{-1}$  under PS that two orders of magnitude lower than that of Ti. Also films exhibited low contact angles ranging from 22 to 28°. The results obtained indicate the hydrophilic nature of the film surfaces.



The biocompatibility of the films was evaluated by both in vitro and in vivo experiments. In vitro study involved the investigation of adhesion, spreading and proliferation of MC3T3-E1 osteoblasts and IAR-2 epithelial cells, morphometric analysis, actin cytoskeleton and focal contacts staining of the cells cultivated on the films. Alkaline phosphatase activity and von Kossa staining of osteoblastic culture were also investigated. In vivo studies were fulfilled by subcutaneous implantation of Teflon plates coated with the tested films in mice and analysis of the population of cells on the film surface. The Ti-Ca-Si-C-O(N) films demonstrated a high biocompatibility and biostability at the experiments in vivo.

The results obtained show that the multifunctional Ti-Ca-Si-C-O(N) films possess a combination of chemical, mechanical, tribological, and biological properties required for orthopedic and dental implants.

*For more information, please contact Prof. D. Shtansky from State Technological University “Moscow Institute of Steel and Alloys”*  
(<http://www.shs.misis.ru>)





## VINF FORTHCOMING EVENTS (2009-2010)

- **January 11-18<sup>th</sup>, 2009:** “European post-graduate training on Nanofilms” / Modules I & II (Part I) in Brussels (See description p.2).
- **April 6-8<sup>th</sup>, 2009:** Workshop on Functional Nanofilms in Cambridge (UK) (See short description p.1).
- **June 3<sup>rd</sup>, 2009:** Female Workshop “Women in research” in Frankfurt (Germany).
- **June 3-6<sup>th</sup>, 2009:** “European post-graduate training on Nanofilms” / Modules IV (Nano Films and Nano Objects: Fundamental aspects) in Frankfurt (Germany) - Draft program already available; please contact the VINF management team by visiting the VINF website [www.VINF.eu](http://www.VINF.eu).
- **October 19-23<sup>rd</sup>, 2009:** “European post-graduate training on Nanofilms” / Modules II (Part II - Optical characterization of Nanofilms) & III (Mechanical applications of Nanofilms) in Moscow and Troitsk (Russia) - Draft program already available; please contact the VINF management team by visiting the VINF website [www.VINF.eu](http://www.VINF.eu).
- **March 22-26<sup>th</sup>, 2010:** “European Conference on Nano Films (ECNF)” in the Liège Convention centre (Belgium).

**CONFERENCE SESSIONS**

- Advanced nanocoatings for mechanical & tribological applications
- Recent progress in biomedical coatings
- Multifunctional and stimulus responsive films for a smarter world
- Nano systems: fundamental approaches towards understanding
- From nanoparticles to nanofilms: manufacturing processes & characterisation methods
- From science to society: mass production & integration of nanofilms

**FIRST CIRCULAR**



**IMPORTANT DATES**

**March 21, 2009**

- Second Circular with preliminary program
- Call for abstracts
- On-line registration (early bird)

**August 21, 2009**

- Deadline for abstract submission

**October 21, 2009**

- Notification to authors
- Call for conference proceedings extended abstracts

**January 21, 2010**

- Deadline for extended abstract submission
- End of early bird registration

[www.ecnf.eu](http://www.ecnf.eu)

## OTHER FORTHCOMING EVENTS (2009)

- **17th International Colloquium on Plasma Processes (CIP 09)**, June 22-26, 2009 - Marseille (France).

[www.vide.org/cip2009.html](http://www.vide.org/cip2009.html)

The aim of this biennial International Conference is to present the recent progress in plasma processing science and technology. 3 half-days will be dedicated to intensive short courses and 3 days devoted to conferences. The deadline submission is March 27<sup>th</sup>, 2009. CIP 09 is organized by the French Vacuum Society (SFV) and will be coupled with SVTM 2009 (Salon du Vide et du Traitement des Matériaux / *International Exhibition on Vacuum and Surface Engineering*) and the 37th A3TS Congress devoted to surface treatment.

### Main Topics:

- Advanced plasma sources
- Plasma diagnostics and modelling
- Multiphase plasmas
- Plasma deposition processes
- Plasma for functional and multifunctional coatings
- Plasma for life science
- Plasma for surface engineering
- Plasma for microelectronics, micro and nanotechnology
- Plasma for energy and environmental applications
- Low temperature plasmas for ITER

- **THERMEC'09 International Conference on Processing & Manufacturing of advanced Materials**, August 25-29, 2009 - Berlin (Germany).

<http://thermec.uow.edu.au/>



The Thermec'2009 Conference will cover all aspects of processing, fabrication, structure/property relationship and engineering applications of both ferrous and non-ferrous materials including advanced materials for biomedical applications, automotive vehicle materials, nanostructured materials, aerospace materials and other advanced materials.

- **Nanotech Insight**, March 29 - April 2, 2009 - Barcelona (Spain)

<http://www.nanoinsight.sabrycorp.com/conf/nanoinsight/09/>

The Nanotech Insight conference is a novel meeting on the scientific, technological and social aspects of nanometre scale systems. This series of conferences aims to integrate the scientific and sociological aspects of nanoscience and technology with lasting relationships between industry and academe, and between scientists, technologists and legislators in the developed and developing areas of the planet.

- **36TH INTERNATIONAL CONFERENCE ON METALLURGICAL COATINGS AND THIN FILMS ICMCTF 2009**

APRIL 27 - MAY 1, 2009 - SAN DIEGO (USA)

<https://www2.avs.org/conferences/icmctf/>

The ICMCTF is internationally recognized as a technical conference that integrates fundamental and applied research focused on thin film deposition, characterization, and advanced surface modification techniques.

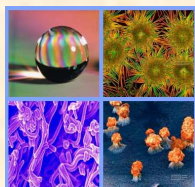


The conference is organized in different technical symposia to address experimental, theoretical, and manufacturing issues associated with development of new coating materials and processes, dynamics of film growth, development of functional coatings, and evolving approaches to scale-up for commercial applications.

- **Smart Coatings 2009**

February 25-27, 2009 - Orlando (USA)

<http://www.emich.edu/smartcoatings/index.html>



The annual Smart Coatings conference organized by the Coatings Research Institute of the Eastern Michigan University will give an overview of the topic, with the presence of leading American scientists such as Prof. B. Ratner from University of Washington.