FEMS

EUROMAT2013

European Congress and Exhibition on Advanced Materials and Processes

SEVILLA 8 - 13 September **2013**

SPM socie mat sociedad española de materiales

Final Program

EURO MAT 2013 | HOTEL **BARCELÓ RENACIMIENTO**

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TUESDAY 10 SEPTEMBER 2013 / AM2

	Symposium	C1I	C1II	C3I	C4I
	Room	España 3	Sevilla 3	Andalucía 6	Sevilla 2
	Session Title	Eutectic/Intermetallic Microstructures	Interaction Phase transformations/ mechanics I	Smart Processing under Extreme Conditions	Protective Coatings and Thin Films IV
	Chairperson	J. Peña and C. Bordreuil	B. Appolaire	Olivera Milosevic	A. Cavaleiro
11:00		*ORAL* **COMPETING CONFIGURATIONS IN A SYMMETRIC TERNARY EUTECTIC SYSTEM** **Abhik Choudhury** (Ecole Polytechnique) Mathis Plapp	*HIGHLIGHT* **PHASE FIELD MODELING OF MICROSTRUCTURE FORMATION: DIFFERENT WAYS TO INCORPORATE PLASTICITY** **Alphonse Finel** (Onera) Maeva Cottura, Benoît Appolaire, Yann Le Bouar	*INVITED / KEYNOTE* **ONE-STEP MECHANICAL PROCESSING TO CREATE NANOCOMPOSITE STRUCTURE AND ITS APPLICATIONS FOR ADVANCED MATERIALS** **Makio Naito** (Osaka University) Hiroya Abe, Akira Kondo	*INVITED / KEYNOTE* **FLEXIBLE DIAMOND-LIKE CARBON FILMS ON VISCOELASTIC SUBSTRATES** **Jeff de Hosson** (Un. of Groningen) Yutao Pei, Diego Martinez
11:20		*ORAL* **INVESTIGATION OF MICROSTRUCTURE OF SINGLE CRYSTAL SUPERALLOY CMSX-6 FORMED DURING DOWNWARD DIRECTIONAL SOLIDIFICATION PROCESS** **Fu Wang** (Giesserei Institut, RWTH Aachen) Dexin Ma, Bogner Samuel, Jianping Hong, Andreas Bührig-Polaczek	*ORAL* **INTERACTION OF THE MARTENSITE TRANSFORMATION FRONT WITH THE PLASTIC STRAIN. PHASE-FIELD MODELING.** **Julia Kundin** (University Bayreuth) Evgeny Pogorelov, Heike Emmerich		
11:40		*ORAL* **TRANSMISSION ELECTRON MICROSCOPY STUDY OF GRAPHITE IN CAST IRONS** **Koenraad Theuwissen** (Cirimat-Ensiacet) Lydia Laffont, Jacques Lacaze	*ORAL* **ROLE OF ELASTIC INHOMOGENEITY DURING THE FORMATION OF CUBOIDAL MICROSTRUCTURES IN NI BASE SUPERALLOYS** **Yann Le Bouar** (LEM, CNRS/Onera) Maeva Cottura, Alphonse Finel, Benoit Appolaire	*ORAL* **EFFECT OF PARTICLE SIZE OF STARTING OXIDE POWDERS ON THE PERFORMANCE OF DOPED- LANTHANUM OXYAPATITE FOR SOFC ELECTROLYTE MATERIALS PRODUCED BY MECHANICAL ALLOYING** **Bruno Trindade** (CEMUC, Mechanical Engineering Department, University of Coimbra, Portugal) Márcio Santos, Mafalda Macatrão, Cátia Alves, Fernando Oliveira, Teresa Marcelo, João Mascarenhas	*ORAL* **A-C HYDROGENATED AND NON-HYDROGENATED FILMS DOPED WITH ZR** **Ana Escudeiro** (SEG-CEMUC, Department of Mechanical Engineering, University of Coimbra) Tomas Polcar, Albano Cavaleiro
12:00		*ORAL* **QUANTITATIVE STUDY OF THE PROCESS OF SPACING EQUALIZATION DURING THIN EUTECTIC SOLIDIFICATION** **Sabine Bottin-Rousseau** (INSP UPMC) Silvère Akamatsu, Gabriel Faivre	*ORAL* **COHERENCY LOSS MECHANISM AND ITS INFLUENCE ON MICROSTRUCTURE EVOLUTION** **Pierre-Antoine Geslin** (LEM, Onera/CNRS) Benoît Appolaire, Alphonse Finel	*ORAL* **MECHANOCHEMICAL SYNSESIS OF DOPED APATITE-TYPE LANTHANUM SILICATES** **Tamara Kharlamova** (Tomsk State University) Svetlana Pavlova, Vladislav Sadykov, Marina Chaikina, Tamara Krieger, Olga Lapina, Vassilis Stathopoulos	*ORAL* **THE ROLE OF COMPOSITION, STRUCTURE AND MORPHOLOGY ON THE ELECTRICAL, OPTICAL AND ELECTROCHEMICAL RESPONSES OF ALNXOY FILMS** **Luis Marques** (University of Minho) Joel Borges, Nicolas Martin, Nuno P. Barradas, Eduardo Alves, Dominique Eydi, Thierry Girardeau, Carlos Fonseca, Filipe Vaz
12:20		*ORAL* **SOLIDIFICATION MECHANISMS AND RESULTING MICROSTRUCTURES IN WELDS BETWEEN DISSIMILAR STEELS** **Fanny Mas** (SIMAP Laboratory) Catherine Tassin, François Roch, Patrick Todeschini, Yves Brechet	*ORAL* **INTERCONNECTION BETWEEN PHASE TRANSFORMATIONS AND PLASTIC DE FORMATION IN ZR-BASED ALLOYS** **Margarita Isaenkova** (National Research Nuclear University) Yuriy Perlovich, Olga Krymskaya, Soe San Thu	*ORAL* **FROM PROCESSING TO MODELLING: HOT UNIAXIAL PRESSING OF A NANOSTRUCTURED N-TYPE SI80GE20** **Achraf Kallel** (Atomic and Alternative Energies Comission, LITEN Laboratory) Christophe L. Martin, Guilhem Roux	*ORAL* **TITANIA-LOADED HYBRID SOL-GEL THIN FILMS AS PRETREATMENTS FOR IMPROVING THE BARRIER PROPERTIES AND BIOACTIVITY OF TI6AL4V ALLOY** **Federico García-Galván** (Universidad Carlos III de Madrid) Amir Abdelsamie El-hadad, Antonia Jimenez-Morales, Juan Carlos Galván
12:40		*ORAL* **AN ADVANCED 3-D STOCHASTIC MODEL FOR PREDICTION OF MICROSTRUCTURE EVOLUTION IN SOLIDIFYING ALLOYS** **Laurentiu Nastac** (The University of Alabama)	*ORAL* **NUMERICAL MODELLING OF TRANSFORMATION PLASTICITY AND MECHANICAL-METALLURGICAL INTERACTION DURING PHASE TRANSFORMATION IN STEELS** **Renald Brenner** (LSPM, Laboratoire des Sciences des Procedes et des Materiaux, Universite Paris 13) Takayuki Otsuka, Brigitte Bacroix	*ORAL* **EFFECT OF EXPLOSIVE POWDER'S CONSOLIDATION IN PHASIC COMPOSITION OF BULK 316L STAINLESS STEEL** **Ana Rita Farinha** (CEMUC - Centro de Engenharia Mecânica da Universidade de Coimbra) Ricardo Mendes, María Teresa Vieira	*ORAL* **ELECTRODEPOSITION OF CR/AG NANOCOMPOSITE COATINGS WITH ANTIBACTERIAL PROPERTIES** **Itziar García-Urrutia** (Cidetec) Belén García-Blanco, Eva García-Lecina, José Antonio Díez

The role of composition, structure and morphology on the electrical, optical and electrochemical responses of AlN_xO_y films

J. Borges[1], N. Martin[2], N.P. Barradas[3], E. Alves[3], D. Eyidi[4], T. Girardeau[4], C. Fonseca[5], F. Vaz[1], L.Marques[1]

[1]Centro de Física, Universidade do Minho, 4710-057 Braga, Portugal

[2] Institut FEMTO-ST, Département MN2S, UMR 6174 (CNRS, UFC, ENSMM, UTBM) 32, Avenue de l'Observatoire 25044 BESANCON Cedex, FRANCE

[3] Instituto Superior Técnico/ITN, Universidade Técnica de Lisboa, E.N. 10, 2686-953 Sacavém, Portugal

[4]Institut Pprime - UPR 3346 CNRS-Université de Poitiers-ENSMA, Département de Physique et Mécanique des Matériaux Bât. SP2MI - Téléport 2, BP 30179 F86962 Futuroscope Chasseneuil Cedex - France

[5]Universidade do Porto, Faculdade de Engenharia, Departamento de Engenharia Metalúrgica e de Materiais, Rua Roberto Frias, s/n, 4200-465 Porto, Portugal

joelborges@fisica.uminho.pt

Metallic (Me) oxynitrides (MeN_xO_y) are an attractive class of materials due to a unique set of versatile properties in different technological domains such as protective applications (wear, diffusion and corrosion-resistance), decorative coatings, gas barriers, microelectronics, optoelectronics, solar cells, etc. Among the group of oxynitrides, aluminium oxynitride (AlN_xO_y) presents some interesting characteristics to be used in different technological fields, since it may combine the behaviour of metallic aluminium, and those of the base binary systems: aluminium nitride, known for its semiconducting and piezoelectric properties and aluminium oxide, for its protective and insulating performances. In this work, thin films of AlN_xO_y were prepared by reactive DC magnetron sputtering, using a pure Al target and an $Ar/(N_2,O_2)$ gas mixture. The overall set of results suggests the formation of a nanocomposite-like material for some stoichiometries, with Al nanoparticles embedded in an AlN_xO_y matrix, forming a percolating network. This particular microstructure induced a wide variation in electrical properties [1], such as a gradual transition from positive to negative temperature coefficients of resistance (TCR) as the (N+O)/Al atomic ratio increases; as well as distinct optical responses [2], such as an unusual low and constant optical reflectance nearly independent of the wavelength (250 – 2500 nm), which opens the possibility of using the AlN_xO_y films in different applications, either in electrical or optical-based devices. The films were also tested in terms of electrochemical and corrosion behaviour, focusing this study on the influence of the immersion in NaCl solutions, which simulate the effect of sweat, on the electrochemical and optical performance of the coatings. Results showed that the films electrochemical and optical responses are very stable, even when immersed for several weeks.

[1] J. Borges, N. Martin, N.P. Barradas, E. Alves, D. Eyidi, M.F. Beaufort, J.P. Riviere, F. Vaz, L. Marques, Thin Solid Films 520 (2012) 6709-6717.

[2] J. Borges, N.P. Barradas, E. Alves, M.F. Beaufort, D. Eyidi, F. Vaz, L. Marques, Journal of Physics D: Applied Physics 46 (2013) 015305.

Symposium: C4.I Protective Coatings and Thin Films

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Centro / Departamento de Física, Universidade do Minho, Portugal

OUTLINE

MOTIVATION

EXPERIMENTAL DETAILS

RESULTS

- **Discharge and deposition characteristics**
  - Target Potential
  - Deposition (growth) rate
- **Characterization of the films**
  - Composition and bonding
  - Structure and morphology
- **Properties of the films**
  - Electrical properties
  - Optical behaviour
  - Corrosion behaviour

CONCLUSIONS