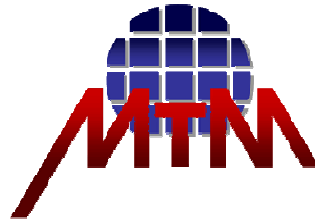
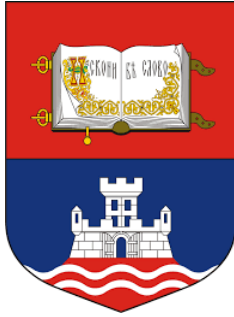


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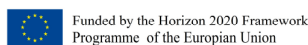
Book of Abstracts

COST MP1402 SCIENTIFIC WORKSHOP

"ALD and related ultra-thin film processes for advanced devices"

Editors

Olga Jakšić and Dana Vasiljević-Radović
Institute of chemistry, technology and metallurgy, Belgrade, Serbia



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Book of Abstracts of
COST MP1402 SCIENTIFIC WORKSHOP
"ALD and related ultra-thin film processes for advanced devices"

29-30 of August, 2017, Belgrade, Serbia

Editors

Olga Jakšić and Dana Vasiljević-Radović

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COST MP1402 WORKSHOP

Belgrade, 29-30 August 2017

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COST MP1402 WORKSHOP

Belgrade, 29-30 August 2017

Workshop Timetable (Serbian Academy of Sciences and Arts)

Day 1: 29 August 2017

08:00 – 09:00 Registration / Opening

Welcome (Director of IHTM-CMT, members of organizing committee)

Session 1: chair Aleksander Kovačević

09:00 – 09:45 /keynote lecture/ "3rd generation of solar cells: Quantum dots arrays based high efficiency solar cell," Stanko Tomić

09:45 – 10:15 /invited lecture/ "Inducing parallel structures on thin metal films by femtosecond laser beam," A. G. Kovačević, S. Petrović, D. Peruško, V. Lazović, D. Pantelić and B. M. Jelenković

10:15 – 10:45 Coffee break

Session 2: chair Goran Isić

10:45 – 11:30 /keynote lecture/ "Hybrid organic/inorganic devices based on graphene and related 2d materials," V. Marinova, Ch. Dikov and D. Dimitrov

11:30 – 12:00 /invited lecture/ "Nickel-Copper Multilayer Metamaterials," M. Obradov, I. Mladenović, Z. Jakšić, J. Lamovec, D. Tanasković

12:00 – 12:15 "Plasmonic enhancement of photocatalytic optofluidic microreactors with corrugated thin metal films," M. Rašljčić, Z. Jakšić, M. M. Smiljanić, Ž. Lazić, K. Cvetanović-Zobenica, D. Vasiljević-Radović

12:15 – 12:30 "Preparation and mechanical characterization of copper thin films with additives on alloy substrates," I. Mladenović, J. Lamovec, V. Jović, M. Obradov, B. Popović, M. Vorkapić, V. Radojević

12:30 – 14:30 Lunch break

Session 3: chair Tanja Novaković

14:30 – 15:15 /keynote lecture/ "Towards atomically sharp interfaces and synchrotron radiation," Ana G Silva, K. Pedersen, Z. Li and P. Mo

15:15 – 15:45 /invited lecture/ "Preparation, Surface Properties and Photocatalytic Performance of Nanocrystalline Titania Films," J. Dostanić, D. Lončarević, B. Grbić, N. Radić, S. Stojadinović, R. Vasilić, Z. Vuković

15:45 – 16:00 "ScCO₂ Deposition of γ -Alumina Supported Pd Nanocatalysts with New Fluorous Precursors and Application in Suzuki-Miyaura Reactions," F. Ulusal, E. B. Hereytani, B. Güzel

16:00 – 16:30 Coffee break

COST MP1402 WORKSHOP

Belgrade, 29-30 August 2017

Session 4: chair Branko Livada

16:30 – 17:00 /invited lecture/ "Can we use nanotechnologies to develop self-decontaminating CBRN protective suits?," M. Vitorović-Todorović and D. Simić

17:00 – 17:15 "Tribomechanical and thermal properties of PVB thin films reinforced with nano IF-WS₂," D. Simić, D. Stojanović, A. Kojović, M. Dimić, P. Uskoković, R. Aleksić

17:15 – 17:30 "Effect of nano-IF-WS₂ and INT-WS₂ on physical-mechanical and camouflage properties of military coatings," D. Lazić, D. Simić, A. Samolov

Day 2: 30 August 2017

08:00 – 09:00 **Registration**

Session 5: chair Danijela Randjelović

09:00 – 09:45 /keynote lecture/ "The application of metal oxide nanoparticles in gas sensing devices," Igor Djerdj

09:45 – 10:00 "Equilibrium fluctuations in bi-component monolayer adsorption represented by a second-order nonlinear model," I. Jokić, O. Jakšić, Z. Jakšić, M. Frantlović, M. Rašljijć and K. Cvetanović-Zobenica

10:00 – 10:15 "Aggregation problem of dye monolayer in dye sensitized solar cells," K. Cvetanović-Zobenica, M. Rašljijć, M.M. Smiljanić, D. Vasiljević-Radović, D. Stanisavljev

10:15 – 10:45 Coffee break

Session 6: chair Filip Radovanović

10:45 – 11:30 /keynote lecture/ "ALD Al-doped ZnO as a Material Platform for Nanophotonics," D. Z. Dimitrov, V. Marinova

11:30 – 11:45 "Artificial Solid Electrolyte Interphase: Design, Synthesis, Characterization and Efficacy Evaluation," Sivan Okashy, Eliran Evenstein, Yitzhak Mastai and Malachi Noked

11:45 – 12:00 "Characterization of AZO Film as Transparent Conductor in Liquid Crystal Devices," N. Bojinov, V. Marinova and D.Z. Dimitrov

12:00 – 12:15 "Polymer-based ultra thin films with incorporated conductive nanoparticles as a platform for plasmonic biosensors," A. Nastasović, D. Tanasković, F. Radovanović, O. Jakšić, Z. Jakšić

12:15 – 12:30 "Generating a Porosity in Metal Oxides Thin Films through Introduction of polymer Micelles," R. Georgiev, D. Christova, L. Todorova, B. Georgieva, M. Vasileva, T. Babeva

Conclusions & Closing

Scope of the Workshop

Theory of 2D and quasi-2D materials

Modeling and simulation of 2D and quasi-2D materials

Fabrication, (nano)patterning and sculpting of ALD-based nanocomposites

Materials, including graphene, metallic, intermetallic and heterometallic single and multilayer films, metal oxides, polymers, etc.

Light-matter interaction in 2D nanomaterials

Photonic and plasmonic devices based on ALD and other ultrathin films

General applications of ALD-based structures and devices

COST MP1402 WORKSHOP

Belgrade, 29-30 August 2017

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Preparation and mechanical characterization of copper thin films with additives on alloy substrates

Ivana Mladenović¹, Jelena Lamovec¹, Vesna Jović¹, Marko Obradov, Bogdan Popović, Miloš Vorkapić, Vesna Radojević²

¹*Centar za mikroelektronske tehnologije, Institut za hemiju, tehnologiju i metalurgiju, Univerzitet u Beogradu, Njegoševa 12, 11000 Beograd, Srbija*

²*TMF – Faculty of Technology and Metallurgy*

E-mail: ivana@nanosys.ihtm.bg.ac.rs

Keywords: electrodeposition, thin film, composite system, microhardness

Thin copper films have various application in the electronic industry for the fabrication of contacts in integrated circuits. Copper electroplating has been widely employed for fabricating the wires of printed circuit boards (PCBs), sidewall metallization of the microvia and through hole in the fabrication of multilayer PCBs [1]. Along with electrodeposited thin Ni films, they may be considered as laminate composite structures with good mechanical properties such as high hardness and tensile strength, which is especially important for the MEMS structures fabrication [2-4].

Electrolytes that are commonly used for the copper deposition are on the base of sulphate salt and sulphuric acid with content of various organic or nonorganic additives in small quantities. One is called the suppressor which is composed of polyethylene glycol (PEG) and chloride ions and inhibits the copper deposition, the other is called the accelerator which is composed of 3-mercapto-1-propanesulfonate acid (MPSA) and enhances the rate of copper deposition [5-6]. The influence of additives and deposition parameters on the structural and mechanical properties of copper coatings was investigated by Vickers microhardness indentation testing method. The measured hardness is called the composite hardness, because the substrate participates in the plastic deformation caused by indentation. Mathematical composite models are used to calculate the hardness of the thin film from the composite hardness and the choice of composite model depends on the type of composite systems. The composite hardness model of Chicot-Lesage (C-L) [7] was chosen and applied to experimental data in order to calculate the copper film hardness.

Copper thin films were electrodeposited from a sulphate bath consisting of 240 g/l $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 60 g/l H_2SO_4 , 0.124 g/l NaCl, 1 g/l PEG, 1.5 mg/l MPSA on two substrates (brass and stainless steel foil). The current density values were maintained at 10 mA/cm² and 50 mA/cm² (DC galvanostatic mode).

Microhardness measurements indicated that the hardness response of the same film depends on type and contribution of the supportive substrate. Composite hardness values show ascending character and copper films deposited on brass substrates have higher composite and film hardness than ED Cu films on steel substrates for the same deposition parameters and thickness, are shown in Fig.1.

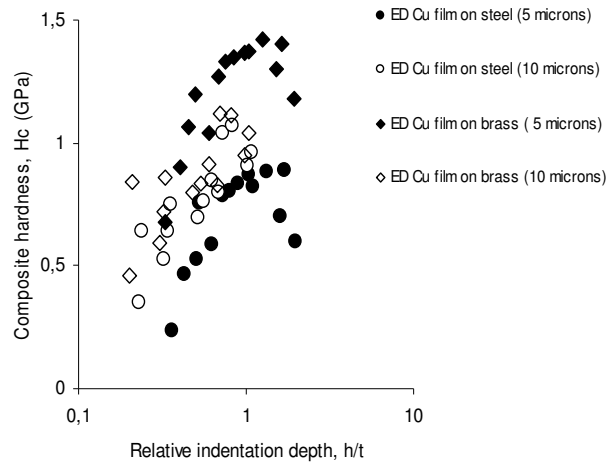


Fig.1. Variation in composite hardness with normalized depth h/t , for electrodeposited Cu film on alloy (brass and steel) with constant current density ($j=10 \text{ mA/sq.cm}$).

The films obtained with higher current density (50 mA/cm^2) appear harder than films deposited with 10 mA/cm^2 . Increase in current density value has led to grain size refinement and hardness increase. The quality of the ED Cu films is satisfactory for the application in MEMS technologies.

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