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PROCEEDINGS OF

2ND ADVANCED MATERIALS SCIENCE WORLD CONGRESS 2021

JUNE 14-15 2021

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ADV. MATERIALS SCIENCE 2021

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A CONFLUENCE OF ERUDITE AND KNOWLEDGE-SEEKER

PROGRAM-AT-A-GLANCE

ADV. MATERIALS SCIENCE 2021

10:55-11:15	**Title: Direct laser patterning of photoluminescent semicondutor quantum dots in polymeric films** **Francesco Antolini,** ENEA Frascati Research Center, Italy
Refreshment Break 11:15-11:30	
11:30-11:50	**Title: Microneedles fabrication technology for sensing and therapeutic applications** **Principia Dardano,** Institute of Applied Science and Intelligent Systems, Italy
11:50-12:10	**Title: High performance Lithium Silicide electrode enable by molecular layer deposition** **Zahilia Cabán Huertas,** Aalto University, Finland
12:10-12:30	**Title: An efficient four-variable I-L nonlocal dynamic model of unsymmetrical plane sandwich structure with laminated facings – Acoustic application** **Stanisław Karczmarzyk,** Warsaw University of Technology, Poland
12:30-12:50	**Title: Microstructure dependent corrosion of Mg-Li alloys** **Anna Dobkowska,** Warsaw University of Technology, Poland
12:50-13:10	**Title: Monitoring the effect of amino acid on the corrosion process of metal based on comprehensive micro- and nanospectroscopy investigations** **Dominika Swiech,** AGH University of Science and Technology, Poland
Lunch Break 13:10-13:40	
13:40-13:55	**Title: W-Zr-B coatings deposited by RF Magnetron – PLD hybrid method** **Rafał Psiuk,** Polish Academy of Sciences, Poland
13:55-14:10	**Title: Photoluminescence of carbon nanoparticles synthesized by laser ablation in water and aqueous solutions of amine-based reagents** **Agata Kaczmarek,** Polish Academy of Sciences, Poland
14:10-14:25	**Title: Analysing the impact of hydrophobic coatings on the reduction in soil accumulation on transparent surfaces intended for PV application** **Małgorzata Rudnicka,** Gdańsk University of Technology, Poland
14:25-14:40	**Title: The effect of plasma treatment of polyethylene powder on the mechanical properties of composites prepared by rotational molding** **Zoya Ghanem,** Czech Technical University, Czech Republic
14:40-14:55	**Title: Ensuring electrical conductivity of polymer-based component** **Jakub Antoň,** Czech Technical University, Czech Republic

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Theme: Navigating the future research directions in the field of Materials Science and Engineering

2nd Advanced
MATERIALS SCIENCE
WORLD CONGRESS 2021
June 14-15, 2021

W-Zr-B coatings deposited by RF Magnetron – PLD hybrid method

R. Psiuk, D. Jarząbek, P. Denis and **T. Mościcki**
Polish Academy of Sciences, Poland

Transition metal borides even in the form of thin films exhibit unique combinations of properties such as high melting points (TiB_2, ZrB_2 T_m>3400K), high hardness (ReB_2, WB_4 H>40 GPa), high thermal and chemical stability, and excellent corrosion and oxidation resistances, that is why in recent years they arouse interest in the research community. In this work, (W, Zr) B_2 films with the different stoichiometric ratio Zr/W deposited by RF magnetron sputtering and hybrid PLD-RFMS methods are presented. Zirconium amount in coatings was increased by increasing the laser power (fluence) on ZrB_2 rotating target. $WB_{2.5}$ target was magnetron sputtered with constant power. The results show the possibility of controlling of phase composition, structure and utility properties of thin films made of novel super-hard tungsten borides doped by Zirconium. In the case of (W,Zr) Bx, this technique enables also precise control of the doping process. Coatings were tested by means of SEM, EDS, XRD, nanoindentation and micropillar compression. The deposited pure WB_2 coatings have crystalline columnar structure with an average feature size of 23 nm and 001 preferred orientation. The columns are separated by a thin, 1-2 monolayers B-rich amorphous phase what guaranteed hardness H= 48.9±0.6 GPa. Different amounts of zirconium can affect phase composition and crystallinity of the coatings. High preserved hardness (up to 50 GPa) and values of elastic recovery higher than 60% suggests that they may be more resistant to cracking than pure WB_2 coatings. Increased fracture toughness with preserved high hardness shows that solid solution strengthening is a good method to enhance the properties of tungsten diboride coatings.

Biography

A graduate of the Faculty of Materials Science and Engineering of the Warsaw University of Technology. In his engineering and master's thesis he dealt successively with PPS pulse plasma sintering and 3D printing using the SLM method. Currently an employee and doctoral student at the Institute of Fundamental Technological Research of the PAS. The subject of the PhD thesis is super-hard layers of tungsten borides with zirconium addition by magnetron sputtering and/or laser ablation.