

FIRST CIRCULAR AND CALL FOR PAPERS

ISSP 2011

July 6-8, 2011
Kyoto Research Park
Kyoto, Japan

THE 11th INTERNATIONAL SYMPOSIUM ON SPUTTERING & PLASMA PROCESSES

<http://issp2011.org>

TOPICAL THEME:

Sputtering Technologies in 201X

INVITED SPEAKERS:

D. Depla (Ghent Univ.), P. Frach (FEP), J. Musil (Univ. of West Bohemia), K. Nanbu (Tohoku Univ.), P.-K. Song (Pusan National Univ.), J.-M. Ting (National Cheng Kung Univ.), M.C.M. van de Sanden (Eindhoven Univ. of Tech.), J. Vlcek (Univ. of West Bohemia)

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ISSP2011: Symposium Program

Wednesday July 6: Oral session
Science Hall 10:00 - 17:00

[Welcome Address]

10:00 Kenji Kimura, Vice President, The Vacuum Society of Japan, Kyoto University, Japan

10:10 Osamu Nakagawara, Chair, ISSP2011 Committee, Murata Manufacturing Co., Ltd., Japan

[Opening Session]

10:20 OP 1-1 **Microstructure and electrical properties of thin films deposited on substrates with different surface conditions by physical vapor deposition**, Y. Yoshino*, Murata Manufacturing Co., Ltd., Japan (*invited*)

11:00 OP 1-2 **High-rate pulse reactive magnetron sputtering of oxide nanocomposite coatings**, J. Musil^{1,2}*, P. Baroch¹), 1) University of West Bohemia, Czech Republic, 2) Academy of Sciences of the Czech Republic, Czech Republic (*invited*)

11:40 OP 1-3 **Crystallization of ITO and TiO₂ by RF plasma treatment**, H. Ohsaki¹*, R. Andou²), A. Kinbara³), T. Watanabe⁴), 1) National Institute of Advanced Industrial Science and Technology, Japan, 2) Industrial Technology Institute of Ibaraki Prefecture, Japan, 3) Institute of Industrial Science, The University of Tokyo, Japan, 4) Research Center for Advanced Science and Technology, The University of Tokyo, Japan

12:00-13:00 **LUNCH BREAK**

[Plasma Processes]

13:00 PP 1-1 **High rate remote plasma deposition of a-C:H: radical chemistry vs. ion energy**, M. C. M. van de Sanden*, Eindhoven University of Technology, The Netherlands (*invited*)

13:40 PP 1-2 **Deep silicon trench oxidation in downstream of surface-wave oxygen plasma**, J. Koike, Y. Igarashi, Y. Taniuchi, H. Shindo*, Tokai University, Japan

14:00 PP 1-3 **Stress and crystallization of hydrogenated amorphous silicon films grown by electron cyclotron resonance chemical vapor deposition**, Y. C. Wang*, P. J. Wu, C. C. Hsieh, I-C. Chen, National Central University, Taiwan

14:20 PP 1-4 **Flat band shift for MIS with insulator gate deposited by an electron cyclotron resonance sputter**, K. Izumi¹*, H. Toyota¹), J. Murota²), M. Sakuraba²), Y. Fukuda³), T. Ono¹), 1) Hirosaki University, Japan, 2) Tohoku University, Japan, 3) Tokyo University of Science, Japan

14:40 PP 1-5 **Optimization and performance of atmospheric Fused Hollow Cathodes**, H. Barankova*, L. Bardos, Uppsala University, Sweden

Science Hall 9:00 - 15:00

[Thin Films I]

09:00 TF 1-1 **Metal-containing diamond like carbons: Self-assembly and Applications**, J.-M. Ting^{1)*}, W.-Y. Wu²⁾, H.-Y. Cheng¹⁾, Y.-H. Lan¹⁾, 1) National Cheng Kung University, Taiwan, 2) Mingdow University, Taiwan (*invited*)

09:40 TF 1-2 **The influence of boron contents on the microstructure and mechanical properties of Cr-B-N thin films**, J.-W. Lee^{1,2)*}, C.-H. Cheng³⁾, J.-G. Duh⁴⁾, H.-W. Chen⁴⁾, Y.-C. Chan⁴⁾, 1) Department of Materials Engineering, Mingchi University of Technology, Taiwan, 2) Center for Thin Films Technologies and Applications, Mingchi University of Technology, Taiwan, 3) Tungnan University, Taiwan, 4) National Tsing Hua University, Taiwan

10:00 TF 1-3 **Oxidation resistance and thermal stability of multilayered CrAlSiN nanocomposite coatings deposited by lateral rotating Cathode Arc**, J. Y. Cheong^{1,2)}, X. Z. Ding¹⁾, B. K. Tay^{2)*}, X. Zeng¹⁾, 1) Singapore Institute of Manufacturing Technology, Singapore, 2) Nanyang Technological University, Singapore

10:20 TF 1-4 **Improvement in the dielectric properties of alkaline earth titanium oxynitride perovskite thin films prepared by reactive sputtering**, I. P. Koutsaroff*, A. Ando, H. Takagi, S. Higai, H. Ieki, Murata Manufacturing Co., Ltd., Japan

10:40 TF 1-5 **Effects of phase coexistence and stress on the metal-insulator transition of V₂O₃ films grown on c-plane sapphire in reactive sputtering**, K. Okimura*, Y. Suzuki, Tokai University, Japan

11:00 TF 1-6 **A Look inside the first 30 years of commercial cathodic arc vapor deposition**, G. Vergason^{1)*}, P. Hatto²⁾, R. Tietema³⁾, A. Anders⁴⁾, 1) Vergason Technology, Inc., USA, 2) IonBond Ltd, UK, 3) Hauzer Techno Coating, The Netherlands, 4) Lawrence Berkeley National Laboratory, USA (*invited*)

11:40 TF 1-7 **In situ spectroscopic ellipsometry for characterization of thin sputtered films**, J. N. Hilfiker^{1)*}, B. Johs¹⁾, G. K. Pribil¹⁾, T. E. Tiwald¹⁾, J. S. Hale¹⁾, J. A. Woollam^{1,2)}, 1) J.A. Woollam Co., Inc., USA, 2) University of Nebraska, USA

12:00-13:00 **LUNCH BREAK**

[Thin Films II]

13:00 TF 2-1 **Mechanical and electrical properties of amorphous TCO films deposited on polymer substrates using magnetron sputtering - ITO:Ce, ITO:Yb, ITO:Sm, IGAO films**, P. K. Song*, Pusan National University, Korea (*invited*)

13:40 TF 2-2 **Controllability of nanocolumnar structures in reactive sputtering with glancing-angle scheme**, Y. Inoue^{1)*}, H. Umeda¹⁾, O. Takai²⁾, 1) Chiba Institute of Technology, Japan, 2) Nagoya University, Japan

14:00 TF 2-3 **Interface layers of Nb-doped TiO₂ films on underwater solar cells for hydrogen generation**, Y. Kishimoto^{1)*}, Y. Ueda²⁾, T. Kimura¹⁾, M. Kadota¹⁾, O. Sakai²⁾, 1) Murata Manufacturing Co., Ltd., Japan, 2) Kyoto University, Japan

14:20 TF 2-4 **Synthesis of carbon doped magnesium hydroxide transparent conductive**

Improvement of the Dielectric Properties of Alkaline Earth Titanium Oxynitride Perovskite Thin Films prepared by reactive sputtering*

Ivoyl P. Koutsaroff, Akira Ando, Hiroshi Takagi, Shin'ichi Higai, and Hideharu Ieki
*Murata Manufacturing Co., Ltd., 1-10-1 Higashikoutari, Nagaokakyoshi, Kyoto
617-8555, Japan*

Barium strontium titanate (Ba, Sr)TiO₃ (BST) thin films have been widely investigated both for high density capacitor applications and for tunable capacitor applications due to their high dielectric constant and the large dielectric tunability. Obtaining intrinsically low dielectric loss BST films with high dielectric constant (>800) and low leakage current has not been concurrently achieved at the same time from polycrystalline thin films deposited at moderate temperatures. In the present study we utilize one-axis-oriented polycrystalline perovskite oxynitride thin films of ABO_xN_y (A=Ba,Sr, Gd, etc., B=Ti,Zr), deposited by reactive magnetron RF sputtering from compound ceramic targets on epi-Pt electrodes or directly on various single-crystal substrates, in order to realize fine control of the perovskite dielectric properties and to attempt to enhanced their dielectric constant. The structural and composition characteristic properties of the A-/B-site co-doped ABO_xN_y thin films are studied by FE-SEM analysis, Atomic Force Microscopy (AFM), FE-TEM, Electron Energy-Loss Spectroscopy (EELS), powder XRD and X-ray Photoelectron Spectroscopy (XPS). Dielectric properties of the obtain thin films were analyzed using precision LCR-meter from 1 KHz to 10 MHz under various electric fields and temperatures.

The changes of the relative dielectric constant ϵ of a given perovskite material and its voltage tunability were systematically investigated by variation of selected deposition parameters, such as oxygen partial pressure and deposition temperature during the film growth while keeping the remaining parameters, such as film A/B ratio, film thickness, substrate material, etc. unchanged. We found that under appropriate deposition conditions it becomes possible to achieve a noticeable increase of the dielectric constant and a significant enhancement in voltage tunability for all oxynitride perovskites, accompanied by concurrent expansion of the pseudo-cubic lattice constants and tetragonality ratios as determined from the XRD data. We also confirmed that all films with enhanced dielectric constant still do have near-zero remnant polarization obtained from Pt/ABO_{3- δ - γ} N_y/Pt capacitor structures for the perovskite films grown with tetragonality ratio, $c/a > 1.01-1.05$ or higher. The structural distortions from cubic(Pm3m) to pseudo-tetragonal cells were confirmed to be present for all types of substrates used for the perovskite film growth under optimized deposition conditions. We provide experimental evidence that anionic substitution can induce structural distortions in ABO_xN_y nonpolar perovskites during the polycrystalline film growth, while the perovskite films remained in paraelectric state at room temperature even their dielectric constant and voltage tunability can be enhanced more than 3 times.

[1] I.P. Koutsaroff et al., MRS Fall Meeting 2010, Symp. K, K11.1.

* 10:20-10:40 a.m. TF 1-4 Friday July 8, 2011: Oral session Science Hall, ISSP2011 Kyoto