S9-2 Next-Generation Ceramic Films and Coatings Promoted by a Novel Interfacial Concept

SHORT DESCRIPTION:

In contrast to silicon technology, which requires very high purity and use extremely low amounts of functional impurities, ceramic technology offers the distinct advantage of fostering ideas-based concepts and stimulating innovation by leveraging the diverse composition and size effects of materials. Among the emerging candidates for next-generation devices, the multifunctional properties offered by oxide heterostructures and their ability to meet sustainability criteria are of increasing interest. Further development of thin-film growth techniques, coupled with accurate characterization tools regarding structure, composition, properties, modeling and theoretical understanding, are prerequisites for the further development of new high-performance ceramics and their devices. The influence of strain, interfaces/surfaces, point and extended defects, composition and stoichiometry, which are key parameters allowing the tuning of properties, must be fully understood in a multiscale approach. Interfacial phenomena not only between oxides but also between oxides and other materials are of great importance, as new properties may emerge. Furthermore, many applications require the use of low-cost and/or low-temperature deposition methods, while others require the integration of ceramics on suitable platforms such as semiconductor wafers or flexible substrates. In such cases, the control of mechanical properties such as stress and strain is essential. To solve the above challenges, 3D-to-2D size effect techniques for non-layered ceramics are being cited.

The symposium aims to bring together scientists and engineers involved in various aspects of the synthesis, processing characterization, and theoretical modeling of multifunctional ceramics and their thin and ultra-thin films, multilayers and nanostructures, creating an interdisciplinary forum to present and exchange current research results, and discuss the latest developments, new ideas and concepts, future trends and challenges.

SESSION TOPICS:

•New and emerging deposition methods: low temperature and/or high speed process; low cost methods
•New deposition methods suitable to control the microstructure of thin films on alternative substrates
•Surface treatments and coatings deposition and functionalization processes
•Cold and Thermal spraying (PVD, CVD, ...), thermochemical, Electro- and electroless plating
•Wet chemical and electrochemical processes such as plating, sol-gel coating, anodization
•Development of alternative substrates (flexible, low costs, and weather resistance)
•Surfaces and coatings modelling and characterization
•Interface structure and interaction science and engineering, adhesion and adhesives
•Defects and grain boundary in ceramic films and substrates
•2D ceramic films and surfaces: synthesis, characterization, and perspective
•Corrosion and oxidation resistance, Thermal protection and diffusion resistance,
•Surface engineering/ coatings in sustainable energy, conversion, optical, electric, photovoltaic and magnetic applications
•Substitution or reduction of critical raw elements in ceramics
•Oxide and oxynitride thin films for renewable energy: photovoltaics, photocatalysis, thermoelectric, piezo-generators

•Strain and curvature control in oxide membranes and nanowires
•Low-dimensional ceramics systems
•Solid state ionics for energy and sensing
•New trends and applications in transparent conducting oxides
•Magnetoelectric, spintronic and spin-orbitronic oxide devices
•Real time and operando characterizations of film growth and functional properties
•Advanced characterization by microscopies or spectroscopic techniques of oxide thin films
•Growth and properties of complex heterostructures, including superlattices
•Epitaxial stabilization of unstable oxide phases
•Defects, their control, control of n- and p-type conductivity in ceramic films

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