Advances in coating and thin film characterization: Towards a comprehensive understanding of microstructure-property-performance relations

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Abstract:
Advanced coatings and thin films providing multi-functional properties like wear and oxidation protection for tools, diffusion barrier properties for microelectronics or ductility for flexible electronics require sophisticated materials selection and architecture design. For a knowledge-based development of such materials, advanced characterization techniques to investigate their microstructure and properties from the micro- to the atomic scale are needed. Within this talk, recent progress in local characterization techniques is highlighted. Examples included are three-dimensional atom probe tomography to study interdiffusion in layered systems as well as cross-sectional nano-diffraction using focused X-ray synchrotron beams to illuminate cross-sectional microstructure gradients. Combining such techniques with failure analysis of coatings and thin films during application or during micromechanical tests enables to understand their degradation, thus providing the basis for further optimization of coating materials and architectures.

About the speaker: Dr. Christian Mitterer is Professor for Functional Materials and Materials Systems and head of the Nano Surface Engineering Center at Montanuniversität Leoben, Austria. He received his Diploma and Ph.D. in Materials Science from Montanuniversität Leoben, Austria, in 1987 and 1994, respectively. His research focuses on establishing the scientific chain between synthesis of advanced multifunctional coatings and thin films, their structure, properties and performance, with particular interest on nitrides, borides, carbides, oxides, metals and alloys. He has pioneered self-adaptation mechanism like age-hardening and self-lubrication of wear-resistant coatings. Christian has published more than 350 papers, about 260 of them in refereed journals, edited nine proceedings and special issues, and holds 5 patents. He is an Editorial Board Member for Surface and Coatings Technology, and has served as Guest Editor for the journals Surface and Coatings Technology, Thin Solid Films, Vacuum, and Advanced Engineering Materials. Christian won the 2001 Erich Schmid Award of the Austrian Academy of Science and the 2005 Research Award of the County of Styria for Nanoscience and Nanotechnology. He is also Honorary Viking of Tribology of the Angström Laboratory, Uppsala, Sweden. In 2012, he has been elected as a Fellow of the American Vacuum Society and in 2016 as a member of the Austrian Academy of Sciences.