Advanced Surface Engineering
Room Ballroom BC - Session SE-ThP

Advanced Surface Engineering Poster Session

SE-ThP-1 Development of Multilayer Nano Nitride Layer for Corrosion and Wear Resistance by Using Magnetron Sputtering Technique, ***Aakanksha Jain***[1], indian institute of technology Roorkee, India; *Rahul S. Mulik, Ramesh Chandra,* INDIAN INSTITUTE OF TECHNOLOGY ROORKEE, India

This Study Investigates the Development of Multilayer Nano Nitride Coatings for Enhanced Corrosion and Wear Resistance, Fabricated Using the Magnetron Sputtering Technique. The Multilayer Coatings, Consisting of Alternating Thin Nitride Layers with Tailored Stoichiometries and Thicknesses, Are Designed to Improve Mechanical Properties and Protect Substrates from Aggressive Environments. The Corrosion Performance of the Coatings Was Assessed Using Electrochemical Impedance Spectroscopy (Eis), a Technique That Provides Valuable Insight Into the Electrochemical Behavior and Protective Efficiency of the Coatings in Corrosive Media. The Eis Results Demonstrated a Marked Improvement in the Corrosion Resistance of the Multilayer Coatings Compared to Uncoated Substrates and Single-Layer Coatings, Indicating Their Superior Ability to Act as a Barrier Against Corrosive Agents.

Nanoindentation Was Employed to Evaluate the Mechanical Properties, Particularly the Hardness of the Coatings. This Technique Allowed for Precise Hardness Measurements at the Nanoscale, Revealing a Significant Increase in Hardness for the Multilayer Coatings Compared to Both the Substrate and Single-Layer Nitride Coatings. The Improved Hardness Is Attributed to the Unique Microstructure and the Stress Distribution Across the Multilayer Design, Which Enhances Wear Resistance and Mechanical Durability.

the Coatings' Microstructure, Phase Composition, and Adhesion Strength Were Further Characterized by X-Ray Diffraction (Xrd), Scanning Electron Microscopy (Sem), and Scratch Testing, Confirming the High Quality of the Multilayer Coatings and Their Strong Interlayer Bonding. Overall, the Multilayer Nitride Coatings Exhibited Enhanced Mechanical and Electrochemical Properties, Providing Excellent Corrosion and Wear Resistance. These Results Suggest That Magnetron Sputtering, Combined with Eis and Nanoindentation, Is an Effective Approach for Developing Advanced Nitride Coatings Suitable for Applications in Harsh Industrial Environments Requiring High Durability and Long-Term Performance. This Study Will Help in Marine Applications for Future Purposes and Be Beneficial.

Keywords: Magnetron Sputtering, Nitride Coatings, Hardness, Corrosion, Marine Application.

SE-ThP-2 Geometry Matters in Magnetron Sputtering: From Source Placement to Film Quality, ***Esteban Broitman***, *Rickmer Kose, Sven Kelling,* SENTYS Inc.

Magnetron sputtering remains a premier thin-film deposition technique, with its performance critically dependent on the spatial relationship between magnetron cathodes and the target–substrate assembly. In this review, we collate experimental findings from the literature into three principal geometric classifications: sputter-up versus sputter-down magnetron orientations, planar versus confocal magnetron arrangements, and on-axis versus off-axis substrate positioning.

For each geometric class, we assess how the arrangement influences plasma confinement, governs the angular dispersion of sputtered species, and ultimately controls key film attributes—including mass density, residual stress, microstructural development, and step-coverage uniformity. By establishing quantitative correlations between spatial parameters and these film properties, we formulate a design-oriented framework to aid researchers in choosing the optimal magnetron configuration for targeted material performance.

To demonstrate practical application, we highlight state-of-the-art deposition chambers and magnetron source designs that permit rapid, tool-free reconfiguration of source–substrate geometry. Such adaptable platforms enable real-time tuning of deposition conditions, granting precise control over thin-film growth in situ.

[1] **ASED Rising Star**

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