PLATHINIUM
PLASMA THIN FILM INTERNATIONAL UNION MEETING
22-26 September 2025
Antibes, French Riviera
www.plathinium.com

# TACKLING LITHIUM-ION BATTERY CHALLENGES WITH PVD TECHNOLOGIES

**J. Alami**
*Materials Science, Energy and Nanoengineering department, University Mohammed VI Polytechnic, Lot 660 Hay Moulay Rachid, 43150 Benguerir, Morocco*

Lithium-ion batteries (LiBs) have become essential components in a wide range of energy systems and are expected to continue experiencing robust growth, powering everything from electronics to electric vehicles and large-scale grid storage. As the demand for higher-performing, longer-lasting, and safer energy storage systems intensifies, the materials science community faces challenges to innovate beyond traditional approaches.
This talk explores how thin film deposition techniques, particularly Physical Vapor Deposition (PVD), are unlocking new pathways to address persistent challenges in LiB technology. While conventional synthesis methods such as solid-state reactions and hydrothermal routes have brought us far, they often struggle to provide the electrical conductivity, interfacial stability, and corrosion resistance required by next-generation devices. PVD, by contrast, offers control over film composition, thickness, and microstructure, enabling the design of tailored surface coatings and functional layers that directly enhance battery performance.
From conformal oxide coatings that stabilize cathode–electrolyte interfaces to silicon-based anode films that accommodate volume changes and suppress degradation, thin films are proving indispensable in overcoming mechanical, chemical, and electrochemical limitations. These engineered layers not only extend battery lifespan but also open new possibilities to innovative LiBs architectures.
This plenary lecture emphasizes the interdisciplinary collaboration needed across surface science, electrochemistry, and materials engineering to fully harness the potential of thin films. By integrating advanced PVD techniques into battery development workflows, we can accelerate the transition toward more durable, scalable, and high-performance energy storage solutions.

**KEYWORDS:**
Lithium-Ion Batteries, Energy Storage, Battery Challenges, Thin Films Technologies, Nanostructured Films, Electrode Design, Interface Engineering, Electrochemical Stability