

The potential of Material Acceleration Platforms (MAPs) for creating resilient and sustainable technology value chains

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Material Acceleration Platforms (MAPs) represent a transformative approach to the development of resilient and sustainable technology value chains. These platforms can identify candidate chemistries and structures via simulations, and database searches and leverage machine learning-based rapid screening to accelerate the discovery and deployment of novel materials, thereby addressing critical challenges in modern technology sectors.

Incorporating high-fidelity advanced characterization in the early phases of material development is crucial for early de-risking. Advanced characterization techniques, such as X-ray diffraction, advanced electrochemical and spectroscopic techniques provide comprehensive insights into the structural, chemical, and physical properties of materials. Long-term testing further contributes to the de-risking process by evaluating the durability and stability of materials under various environmental and operational conditions. Early identification of potential degradation mechanisms enables the refinement of material compositions and processing methods, ultimately leading to the development of more resilient materials.

Early upscaling attempts are integral to assessing the feasibility of material leads generated through machine learning-based rapid screening to evaluate the scalability of synthesis and processing techniques. This step is critical for identifying potential challenges in manufacturing, such as issues related to reproducibility, yield, and cost-effectiveness. Process design has to be a major part of the MAP-based material design to cope with the increasing share of secondary raw materials in supply chains.

This presentation will briefly summarize possible strategies to address these issues and provide deep-dives on best practices. As the demand for advanced materials continues to grow, MAPs will play an increasingly vital role in driving technological advancements and addressing global challenges.

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