SPECIAL SESSION 2: ROOM & TIME TBD

Novel Materials and Additive Manufacturing Techniques to Improve the Performance Limits of Electric Machines

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The rapidly growing demand for more efficient, compact, and powerful electric machines is driving innovation in both materials science and manufacturing techniques. Electric machines are central to various applications, including electric vehicles (EVs), renewable energy systems, and industrial automation. However, the achievable power density, efficiency, and other performance metrics are limited by today's materials and manufacturing methods. This special session explores the potential of novel materials and advanced additive manufacturing (AM) techniques to push the boundaries of electric machine performance, addressing the challenges of energy efficiency, weight reduction, and cost-effectiveness.

New materials with enhanced electrical, magnetic, and thermal properties are at the fore front of electric machine innovation. For instance, advanced soft magnetic materials, ultra-conductors, and nanostructured materials are poised to dramatically improve the performance of components such as stators, rotors, and windings. These materials offer superior magnetic permeability, lower eddy current losses, and improved conductivity, leading to more efficient and power-dense machines.

Additive manufacturing (AM) presents a revolutionary approach for producing complex geometries and highly customized components, which were previously impossible or prohibitively expensive using traditional manufacturing methods. AM is a key enabler for the creation of electric machine components with optimized topologies, reduced material waste, and enhanced thermal and magnetic properties. These techniques also facilitate rapid prototyping and short production cycles, allowing for more flexible and cost-effective design iterations. The ability to produce complex multi-material structures using AM further enables the integration of novel materials within electric machines, offering customized solutions to specific performance needs.

Advanced materials and additive manufacturing techniques together present a paradigm shift in the design and production of electric machines. By enabling the development of components with enhanced performance characteristics, these innovations will help address the growing demands for higher power densities, energy efficiency, and reliability in a wide range of applications. This session will provide a platform for researchers, engineers, and industry professionals to explore the latest advancements, share insights, and discuss the challenges and future opportunities in utilizing novel materials and additive manufacturing for electric machine performance improvement