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Nanocrystalline Soft Magnets: Applications, State-of-Art, and Emerging Trends (invited)

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Numerous emerging trends are driving needs for advanced soft magnetic materials and devices including rapid deployment of renewables within the electric power grid and electrification of the transportation sector. Amorphous and nanocrystalline soft magnetic alloys have emerged as a premier solution for many of these applications including high-speed motors as well as medium frequency transformers and inductors for emerging power electronics-based converters. This presentation will provide an overview of recent developments in the field, inclusive of emerging alloy chemistries and advanced manufacturing approaches as well as device level applications. High potential areas for new research directions moving into the future will also be discussed, with particular emphasis on the perspective of optimal nanocrystalline alloy / device integration for improvements in key figures of merit such as size, weight, efficiency, and thermal performance. Broader needs for workforce development in advanced magnetic materials and devices for power applications will also be addressed.