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Hysteresis Design of Magnetic Materials for Efficient Energy Conversion

Thursday, 07 November 2023, 9:00 s.t., TU Darmstadt, via Zoom



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Additive manufacturing of magnetic materials for electrical machines

Abstract:

Additive manufacturing of functional materials in general offers interesting opportunities: components of complex geometry, efficient use of material and specifically tailored properties.

The presentation highlights requirements, status and perspectives for high-performance hard magnetic materials (rare-earth based magnets) and soft magnetic materials (Fe-Si based magnets) additively manufactured by laser powder bed fusion (LPBF). In the case of hard magnets, the main challenge is the processing of extremely oxidation-sensitive powders and the realization of suitable microstructures in the printed parts to enable good hard magnetic properties. In the case of soft magnets, the main challenge is the reduction of eddy current losses for high rotational frequencies of electrical machines. Here, combining soft magnetic material with topological structures and composite structures of alternating electrical insulating and soft magnetic material seems to be promising. To meet the challenges, special lab-scale processing chambers for LPBF have been developed.

About the speaker:

Dagmar Goll is a professor of Physics of Magnetic Materials at Aalen University (Materials Research Institute). Her scientific interests are research and analysis of novel magnetic materials and processing methods, microstructure property relations, and fundamental physics of magnets (micromagnetism). In her career, she obtained her Ph.D. in Physics from University of Stuttgart/Max Planck Institute (MPI) for Metals Research (group Prof. Kronmüller). She was awarded with a research stipend of German DAAD for a postdoc position at the University of California, San Diego (group Prof. Bertram). Until 2010 she was a junior research group leader at MPI Stuttgart "Magnetic Nanostructures" and habilitated at the University of Stuttgart.