TECHNISCHE UNIVERSITÄT CHEMNITZ

Institut für Physik
Physikalisches Kolloquium

Mittwoch, 04.12.2019, um 11:15 Uhr

Ort: Reichenhainer Str. 90;
Zentrales Hörsaal- und Seminargebäude,
Raum 2/N013

Dr. Anja Waske

Bundesanstalt für Materialforschung und -prüfung (BAM) and
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Non-destructive testing of materials and composites

Functional materials for energy conversion are important technology drivers needed for the implementation of low carbon energy. Therefore, researchers commonly focus on improving the intrinsic properties of a functional material. However, for applications, the extrinsic properties are at least as important as the intrinsic ones. Consequently, it is important to investigate and understand the external and internal structure of semi-finished products and especially defect dependent properties. The extrinsic properties may change during application and the life cycle of the material as well as through processing and molding steps.

Our studies show how X-ray tomographic (XCT) investigations can contribute to structure investigations in composites and massive samples using the example of magnetic materials for energy conversion. The components are tested non-destructively in 3D in order to localize and characterize cracks, pores, inclusions as well as other defects and their influence on the functional properties and also “in-time” during the life cycle of the material. Ex-situ and in-situ experiments performed with non-destructive XCT are predestinated to follow damaging mechanisms of materials under certain load conditions, atmospheres or liquids, e.g. went through several working cycles of a functional material. By combining microtomography with other methods of magnetic and classical material characterization, unique statements about the structure and the functional properties can be made.

From the applications point of view, sometimes complex, three-dimensional geometries are needed to fully exploit the functional properties of the materials, e.g. to ensure a high surface area for heat exchange. Since many functional materials are brittle and difficult to form, shaping is often a big challenge. In principle, additive manufacturing processes offer the possibility to produce complex, porous components from poorly formable alloys. If all stages of additive manufacturing are accompanied by X-ray tomographic imaging, the process of finding the optimal parameters for material processing can be significantly accelerated.

Based on the quality control of the initial powder material used and also investigations of the shape and arrangement of defects within the molten structure and their relationship with the melting path scanning strategy, X-ray tomography has proven to be an ideal tool for additive manufacturing, even for functional materials. Overall, tomographic methods are important tools for the development of functional materials to application maturity.

Alle Zuhörer sind ab 11:00 zu Kaffee und Tee vor dem Hörsaal eingeladen.

Informationen zum Vortrag erteilt:
Prof. Dr. Sibylle Gemming, Tel. 0371 531 33531

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