

Non-Isothermal Approaches to Evaluating Sintering Activation Energy

The determination of activation energy of thermally activated processes is conventionally carried out through a series of isothermal experiments and application of the Arrhenius equation. However, this approach cannot be directly applied to ceramic sintering, as it proceeds continuously through multiple stages across a broad temperature interval. The correct determination of non-isothermal kinetic parameters involves the use of experimental data recorded at several heating profiles and their evaluation using various theoretical models. Among the most employed approaches are the Constant-Rate-of-Heating (CRH) and the Master Sintering Curve (MSC) methods. In this study, the sintering behaviour of selected monolithic and composite oxide ceramics was investigated by high-temperature dilatometry, and the corresponding activation energies were determined. Furthermore, modified methodologies based on the Master Sintering Curve, including the Two-Stage Master Sintering Curve (TS-MSC), the Master Shrinkage Curve (MShC), and the Master Sintering Surface (MSS), were developed to describe more complex sintering schedules, anisotropic shrinkage, and pressure assisted sintering, respectively. With their help, for example, Two Step Sintering of monolithic ceramics and sintering of laminated composites were described. In such systems, more activation energies are required here to adequately characterize the sintering process, and their physical significance is discussed.

Professional Status of the Speaker

Senior Scientist

Interest in submitting a paper in a special issue of

Journal of the European Ceramic Society (Elsevier)

Invitation letter for visa

No

Author: MACA, Karel (Brno University of Technology)

Co-authors: Dr DRDLIK, Daniel (Brno University of Technology); Prof. SHEN, James Zhijian (Stockholm University); Dr DRDLIKOVA, Katarina (Brno University of Technology); Dr POUCHLY, Vaclav (Brno University of Technology)

Presenter: MACA, Karel (Brno University of Technology)

Session Classification: Modelling and simulation of sintering at multiple scales

Track Classification: Group 1: Modelling and simulation of sintering at multiple scales