

Rapid sintering to obtain tough and strong alumina-based ceramics

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Layered ceramics have proved effective against contact damage and thermal shock, associated with the effect of compressive residual stresses and/or textured microstructure against surface crack propagation. In addition, the use of “rapid sintering” non-conventional techniques has made feasible tailoring the size and/or shape of grains in bulk alumina materials. In this study we explore the effect of rapid sintering on the mechanical response of layered ceramics, combining in-plane residual stresses with tailored microstructures in the different layers.

Two different layered designs are investigated, sintered using a pressure-less SPS with heating rates of up to 450 °C/min. In a first design, zirconia-toughened alumina (ZTA) is embedded between alumina (EA) layers, in order to generate in-plane compressive residual stresses in the surface and fine-grained microstructure. Biaxial bending tests are performed and compared to rapid sintered and conventionally sintered bulk alumina samples. In a second design, templated alumina (TA) layers are embedded within a fine-grained (EA) alumina matrix to combine the effect of internal compressive residual stresses and crack deflection potential. Selected Hertzian contact and thermal shock experiments are performed in the rapid sintered samples. Results are analysed in regard to the microstructural features and crack deflection capability of the embedded textured layers.

Professional Status of the Speaker

Senior Scientist

Interest in submitting a paper in a special issue of

No interest

Invitation letter for visa

No

Author: Prof. BERMEJO, RAUL (Technical University of Leoben)

Presenter: Prof. BERMEJO, RAUL (Technical University of Leoben)

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