Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION X
New Frontiers in Multifunctional Material Science and Processing

Serbian Ceramic Society
Institute of Technical Sciences of SASA
Institute for Testing of Materials
Institute of Chemistry Technology and Metallurgy
Institute for Technology of Nuclear and Other Raw Mineral Materials

PROGRAM AND THE BOOK OF ABSTRACTS

Serbian Academy of Sciences and Arts, Knez Mihailova 35
Serbia, Belgrade, 26-27. September 2022.

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INV1
Multi-phase (Zr,Ti,Me)B_2 solid solutions: preparation and microstructure evolution

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ZrB_2 is widely recognized as the most prominent ultra-high temperature ceramic for aero-space applications, in view of its melting point above 3000°C, and despite it exhibits lower oxidation and ablation resistance as compared to HfB_2, it has a much lower density. The addition of TiB_2 further lowers the overall weight, which is a relevant factor for materials intended to flight, but it also worsen the oxidation resistance. In this work, different Me-compounds, where Me = Nb, Hf, Cr, V, are added to the ZrB_2-TiB_2 system to study their effect on the densification, microstructure and thermo-mechanical properties. By adjusting the processing and sintering cycles, fully dense multi-phase ceramics with density in the 5.3-5.7 g/cm^3 range and hardness close to 24 GPa have been obtained. A common feature to all materials, is the formation of solid solutions and microstructural details obtained by x-ray diffraction, scanning and electron microscopy are highlighted. Particularly, we explored the nanotexturing of the shell within micron-sized boride grains of the matrix, which resulted from the preferential precipitation of Me-compounds with poor solubility within ZrB_2 or TiB_2 lattice. Preliminary bending strength and oxidation behavior of these intricate bulk multi-phase ceramics are also provided.

INV2
Rare earth co-stabilizing of zirconia - an engineering toolbox for creating structural ceramics with tailored mechanical properties

Frank Kern

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Transformation toughening, a stress induced martensitic phase transformation associated with volume expansion and shear is the main source of toughness and strength in zirconia structural ceramics. The commercially available portfolio of TZP (tetragonal zirconia polycrystal) materials is however very narrow and dominated by yttria and ceria stabilized zirconia materials which either lack toughness and low temperature degradation resistance or strength.
Shifting from co-precipitated starting powders to "stabilizer-coated powders" which are either made by wet chemical methods or by intensive co-milling of monoclinic zirconia and the stabilizer oxides open a new perspective to manufacture TZP materials with very favorable