

Effect of Phase Transformation on the fracture toughness of ZrO₂-Y₂O₃-ceramics obtained by powder metallurgy and 3Dprinting

Initiative: Trilaterale Partnerschaften – Kooperationsvorhaben zwischen Wissenschaftler(inne)n aus der Ukraine, Russland und Deutschland

Bewilligung: 30.06.2020

Laufzeit: 3 Jahre

Zirconia ceramics are materials of great scientific and practical importance because of their combination of advantageous properties, such as high strength, chemical inertness, good abrasion and wear resistance, high melting point as well as high electrical resistivity. Due to their excellent properties, ceramics are used in a wide range of applications, including the chemical industry, machinery, electronics, aerospace and biomedical engineering. The project is part of an attempt to create an integrated (comprehensive) algorithm of predicting the material properties, namely, creation of a database of materials, where the traditional route "composition-structure (and its change)-properties" is completed by an adequate computer model. The aim of the project is to detect common regularities of the grain size effect and phase stability on phase transformation in the system ZrO₂-Y₂O₃ in the process of crack propagation in a sintered monolithic ceramics and the development of a numerical model, adequately describing the process of phase transformation in the grains of zirconia under the condition of crack propagation. The use of 3D printing, as perspective sample rapid prototyping technique is needed to comprehensive study of structural peculiarities, phase transformation and its effect on mechanical properties of zirconia ceramics. The developed models will be in demand by engineers and experts interested in optimization of fracture toughness of ceramic materials prone to phase transformations.

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