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EDITOR-IN-CHIEF'S WORD

Dear readers,

The guest editor of this issue is a member of our Academy from the Department of Mechanical Engineering and Naval Architecture, Prof. Lidija Ćurković, Ph.D, full professor at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb.

The research of the author and her collaborators in the field of monolithic and composite ceramics has led to a number of scientific papers, some of which are very interestingly presented in this issue of our publication. I believe that you will read the presented papers with interest.

Editor
Vladimir Andročec, President of the Croatian Academy of Engineering

EDITOR'S WORD

Dear readers,

It is our pleasure to present in this edition of HATZ bulletin Engineering Power prominent scientific research in the domain of production of advanced ceramics carried out at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb.

The Guest-Editor of this issue is Lidija Ćurković, Associate Member of the Academy and Professor at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb, who presents part of the research activities of the Faculty's Laboratory for Engineering Ceramics.

Since the production and application of new advanced materials is one of the most important fields of modern science and technology, I am sure that you will enjoy reading the presented contributions.

Editor
Zdravko Terze, Vice-President of the Croatian Academy of Engineering

FOREWORD

The production of advanced ceramics as inorganic non-metallic materials is an important and one of the most economically potential branches in the developed countries, which is why it has received a lot of attention in many industrial fields.

The formation of the crucially important microstructure and thereby the desired properties (mechanical, tribological, corrosion resistance, etc.) of the advanced ceramic product are influenced by the appropriate selection of raw materials and additives, the process of forming the so-called green bodies (i.e., presintered bodies), and the sintering process (conventional and non-conventional). This type of "linked" research, which studies the connection between the structure, the forming process, and the modelling of properties to achieve faster engineering applications, is still relatively rare in Croatian science. It represents a much-needed paradigm shift to bring the Croatian scientists closer to the current international trend of goal-oriented problem solving.

The scientific papers summarized below represent a part of the scientific research in the field of monolithic and composite advanced ceramics done by the members of the Laboratory for Engineering Ceramics at the Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb. The presented studies were carried out within the framework of the project "Monolithic and Composite Advanced Ceramics for Wear and Corrosion Protection" (WECOR, IP-2016-06-6000) funded by the Croatian Science Foundation.

The first paper deals with the investigation of the influence of the combinations of three dispersants on the viscosity of highly concentrated aqueous alumina suspensions. The suspensions were used for slip casting forming, and stable suspension composition was statistically optimized. Slip casting is one of the simplest ceramics forming methods. Other forming methods, besides casting, include pressing and plastic forming. Slip casting can be used for the manufacture of ceramic prototypes, parts with complex geometries, and large items. It is a simple, reliable, flexible, cost-effective and pollution-free process, but it requires an adequate understanding of colloidal suspensions and their behaviour. To produce high-quality sintered ceramic products, it is necessary to ensure the stability of the suspension, which determines the homogeneity of the suspension composition, and ensures the isotropic properties of the ceramic green body.

The second paper compares the morphology and mechanical properties (Vickers hardness, Vickers indentation fracture toughness and the indentation size effect using Vickers method and brittleness index) of cold isostatically pressed Al_2O_3 samples sintered by conventional (electrical) and non-conventional (hybrid microwave) techniques. The hybrid microwave heating was developed and used because the generated temperature field is distributed more evenly in the heated material, thus achieving uniform heating over the entire cross-section of the material and consequently avoiding the density gradient. By uniform heating, alumina ceramics with a more homogeneous and fine-grained microstructure and therefore improved final properties, can be obtained.

The last paper presents the study of the wear resistance of the slip cast monolithic and composite ceramics to solid particle erosion at different erodent (SiC) particles impact angles (30°, 60° and 90°) by measuring the erosion rate and surface roughness parameters. It was found that the erosion wear resistance of the monolithic alumina ceramics can be further improved by incorporating a small amount of zirconia (ZrO_2) particles in the alumina matrix in order to produce advanced Al_2O_3-ZrO_2 composite ceramics.

Guest-Editor
Lidija Ćurković, University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture