Serbian Ceramic Society Conference
ADVANCED CERAMICS AND APPLICATION IX
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, 20-21. September 2021.

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resistance, and many other microelectronic parameters, as well. Also, we extended neural network application on grain sizes distribution as a function of sintering temperature, as well as, on establishing the relation between consolidation parameters, like applied voltage and sintering temperature as input vectors, and relative capacitance change.In this sense we used this method to define breakdown voltage, dielectric loss tangent and density, as well. It is of great importance to determine, predict and also design microstructure and properties of ceramic materials, which open new frontiers for further microelectronics miniaturization and integrations, and in our research we accomplished that by applying back propagation neural networks.

P

NOVEL GLASS-CERAMIC SEALANT WITH ADDITION OF ALUMOSILICATE-BASED WASTE MATERIAL FOR APPLICATION IN IT-SOFC

N. Nišić[1],J. Gulicovski[1], M. Kragović[1], A. Nedeljković[1], M. Žunic[2,] M. Rosić[1]andM. Stojmenović[1]

[1]Department of Materials,"VINČA",Institute of Nuclear Sciences-National Institute of the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, 11000, Belgrade ,Serbia

[2]Institute for Multidisciplinary Research, University of Belgrade, Kneza Višeslava 1, 11030, Belgrade, Serbia

In the present paper, possible application of novel concept synthesis method of glass-ceramic sealant with implementation of alumosilicate-based waste material in intermediate temperature solid oxide fuel cells (IT-SOFC) was investigated. Besides basic components for glass-ceramic sealant (sample GC0), for this purpose four additional sealant compositions with certain waste content, designated as GC1, GC2, GC3, GC4, were prepared for a comparative study. Waste was added in the basic sealant composition in such a way that certain percent of alumosilicate clay was substituted with alumosilicate-based waste material, with proper amount of water as a solvent. Waste share in compositions was 5, 10, 15 and 20% of total amout of alumosilicate clay as a replacement, respectively.A total of five different joint specimens were assembled by placing a sealant paste of 10mm thickness between two bricks to form brick/glass–ceramic/brick sandwich specimens appropriate for further heat treatments. Such formed 'green' joints were initially air-dried for 24h at room temperature, which was required for solvent to evaporate and cause initial bonding. Heating cycle in the period of four weeks was carried out in a chamber furnace. First day samples were heated to 200˚C for 2 h. Each day heating temperature was raised for 100 °C while dwelling time was prolonged for one hour, so by the end of the first week samples were heated to 600 °C for 6 hours. Next three weeks annealing of the samples was performed at 600 °C for 6 hours, 700 °C for 7 hours and 800 °C for 8 h, respectively, after what the thermal cycle was completed. The heating rate of the furnace at each heating step in the given joining process was 5 °C/min,while cooling was at natural speed. Mentioned firing temperatures were selected in accordance to common operating temperature range of IT-SOFC so as to simulate real working conditions. After the completion of the cycle, it was observed that all variants of the sealant withstood high temperatures without significant cracks or damage. Moreover, after detailed chemical, physical, mechanical and optical properties examination it was determined

that compositions remained unaltered, which clearly indicates to their stability and reliability that is required for their application as sealants for IT-SOFC components. In addition, this research shows the possibility of forming a cost-effective, environmentally-friendly and high-efficient sealant for application in IT-SOFC by incorporating waste materials in its composition, without significant negative effects on its performance and main properties.

P

Synthesis of spherical SBA-15 silica particles without the use of additional cosurfactant

Maja Kokunešoski[1], Zvezdana Bašćarević[2], Svetlana Ilić[1], Ana Valenta-Šobot[1], Ana Grce[1], Milica Pošarc-Marković[1], Aleksandra Šaponjić[1]

[1]Vinča Institute of Nuclear sciences, Institute of National Importance for the Republic of Serbia, University of Belgrade, Mike Petrovića Alasa 12-14, Vinca, 11000 Belgrade, Serbia
[2] Institute for Multidisciplinary Research, University of Belgrade, Kneza Višeslava 1, 11030 Beograde, Srbija

The synthesis of SBA-15 material with spherical particles is performed by the template method by using only a surfactant Pluronic P_{123}under acidic conditions. In the synthesis of SBA-15 with spherical particles, an HCl solution was used after specialised chemical treatment of clay purification. The dominant presence of the spheres with diameters up to around 2 μm was confirmed by the scanning electron microscopy(SEM) method. In contrast, the Energy-dispersive X-ray spectroscopy(EDS) confirmed that the spheres consisted only of SiO_2 in composition. In addition to the methods mentioned above, X-ray diffraction (XRD), and Fourier-transform infrared spectroscopy(FTIR) methods were used to characterise SBA-15 materials. Application of HCl solution after chemical treatment of clay purification represents the application of technology in the synthesis of spherical SBA-15.