The American Ceramic Society

42nd International Conference & Exposition on Advanced Ceramics and Composites

ABSTRACT BOOK

January 21–26, 2018
Daytona Beach, Florida

The American Ceramic Society
www.ceramics.org

(ICACC-S14-P054-2018) The role of microstructure in dichroic properties of the Lycurgus cup glass

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Lycurgus cup (LC) is is a roman diatreta cut from a blank of typical NCS glass. The glass is dichroic, appearing green in reflected daylight and red in transmitted light. The dicroism of the LC glass is usually derived from the presence of mixed Ag-Au nanoparticles (AuAgNPs). To study the optical properties of LC the glass was prepared starting from the batch calculated using the data published. The glass was molten at 1500°C, poured and quenched with further annealing. The material obtained is a transparent green glass without visible dichroism and phase separation. The colour is caused by the Fe(+2) and Fe(+3) ions in its composition (total Fe 1,14%, ICP MS). During striking the glass becomes dichroic and semiopaque due to the secondary phase separation. The resulted multiphase structure consists of discrete inclusions of glass 1 in a continuous silicate matrix of glass 2. The heat-treatment results in devitrification of a glass 1 that crystallizes giving α-quartz and α-cristobalite microcrystals (confirmed XRD) that strengthen the material. Although iron ions don't enter the crystal phases, they from an important role in phase separation. This fact proves the importance of iron as a glass micro component. The red colour of LC glass in transmitted light is due to the light absorption of AuAgNPs while the green colour in reflected light is caused by scattering on glass 2 droplets and microcrystals.

(ICACC-S14-P055-2018) Development of Yttria Nanopowders for the Photoluminescence Applications as PTC material

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Light scattering due to birefringence has prevented the use of polycrystalline ceramics with anisotropic optical properties in applications such as laser gain media. However, continued technological advancements in ceramic processing technology have made it possible to tailor the microstructural, mechanical and optical properties of different transparent medias. More recently, interest has focused on the development of high optical polycrystalline transparent ceramics (PTC) materials. The PTC are being produced through wet chemical synthesis routes as well as solid state routes. The wet route processes are capable to counter the challenges of purity and chemical stability requirements to achieve high-purity final products. The present work deals with the preparation of Yttria (Y_2O_3) nano-powders by using Ammonium Hydrogen Carbonate (AHC) as a precipitant. The powder characterization of Y_2O_3 nanopowders were examined by using various techniques such as TGA/DSC, XRD, FESEM, EDX, and TEM. It is found that the final phases of the precursors and morphologies were evidently influenced by the molar ratio of (AHC)/(Y^{3+}). An important theme of the work that Y_2O_3 nanopowders produced exhibit morphologies either like needles, rods or spherical. Results obtained in this work theme can contribute to the controllable synthesis of Y_2O_3 nano-powders for advanced transparent ceramics applications.

(ICACC-S15-P056-2018) Polymer-derived ceramic/graphene oxide 3D structures

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3D printing methods allow the development of complex computer-designed geometries by sequential addition of material. These methods are attractive for building tridimensional stable structures of basically 2D materials, in particular graphene-based structures. Starting from graphene oxide sheets self-supported spanned structures were constructed by a computer controlled filament deposition method. GO water based inks (about 5 wt. % solids content) with a shear thinning rheology provided by the addition of polyelectrolytes were employed. These 3D GO structures are used as a platform for making hybrid composites by infiltrating with a preceramic polymer. After several heat treatment steps structured GO /ceramic composites were achieved. These composites are electrically conductive and, in addition, the ceramic hybridization allows increasing the mechanical resistance up to a 750% with respect to the initial GO structure and the thermal stability up to 1000ºC, thus obtaining structures highly conductive and stable at very high temperatures.

(ICACC-S17-P057-2018) Melting gel for encapsulation applications towards high UV and thermal-stable with low processing temperature

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The melting gels are mainly based upon a mixture of low-molecular weight of methyltriethoxysilane(MTES) and dimethyldiethoxysilane(DMDES). A very unique rheology property of the MTES-DMDES gel is rigid at room temperature, flow at temperatures above 110°C, but can become rigid at temperatures above 110°C after processing at temperatures higher than the consolidation temperature about 160°C. As an example, encapsulation application of the melting gel in UV-LED is studied. The preliminary results are described below. For silicone, thermal degradation started at approximately 200°C, and the transmittance was 85.5% at 365nm. The transmittance decreased by 55% after thermal aging at 250°C for 72 h, and it decreased further by 2.5%, even at room temperature, under continuous exposure to UV light at 365 nm for 72h. By contrast, for the MTES-DMDES-gel, thermal degradation started at approximately 300°C, and the transmittance was 90% at 365 nm. The transmittance decreased negligibly after thermal aging at 250°C for 72 h and it did not decrease further even at 75°C under continuous exposure to UV light at 365 nm for 72 h. Hence, the MTES-DMDES gel clearly reveals a better encapsulation material. Furthermore, the latest result of exploiting MTES-DMDES-based melting gel composition effect on higher UV and thermal-stable with lower processing temperature is further discussed.

(ICACC-GYIF-P058-2018) ZrO_2- Y_2O_3 Phase Diagram and Properties Relevant to Ceramic Dental Crown

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3 mol% yttria stabilized tetragonal zirconia is commonly considered for ceramic dental crown due to its superior mechanical properties, chemical durability, and translucency. ZrO_2- Y_2O_3 phase diagram is being studied to find the effect of simultaneous presence of tetragonal and cubic polymorphs of zirconia on densification, mechanical properties, and translucency. The implications of the polymorphs on dental crown will be discussed although no quantitative relationship between the amount of different polymorphs and the properties has been observed.

(ICACC-GYIF-P059-2018) Investigations of matrix-platelets interactions during sintering of ice-templated ceramics and relation to macroscopic compressive response

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Ice-templated ceramics exhibit a macroscopic structural anisotropy, but at microstructural length-scale contain equiaxed grains within the lamella walls and lamellar bridges. Our recent work has revealed that introduction of anisotropic grains (platelets) has significant effects on the structural evolution at multiple length-scales of ice-templated alumina ceramics. Moreover, grain-level modifications can result in marked improvements of macroscopic mechanical response. However, there is a need to thoroughly understand the interactions of fine-grained alumina matrix and anisotropic alumina