Poster Presentation

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Nucleating agent controlled crystallization and thermal properties of K-Mg-B-Al-Si-F glasses

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In exploring the nucleating agent controlled crystallization of aluminosilicate glass, the K2O-MgO-B2O3-Al2O3-SiO2-MgF2 glass-system with excess TiO2 and ZrO2 content (5 wt%) were studied by means of a non-isothermal DSC technique, X-ray diffraction, FESEM and dilatometry. The aluminosilicate glasses were synthesized by single step melt quench technique at 1550°C (2 h). Addition of TiO2 and ZrO2 effectively increased the glass transition temperature (Tg) as well as softening point (Td). According to the DSC study, the crystallization exotherm exhibited the highest peak in the temperature range 800-950°C; and the crystallization temperature (Tc) considerably decreased in presence of ZrO2 content. The addition of 5 wt.% ZrO2 furthermore affects in increasing the glass phase stability due to formation of crystallization onset point at higher temperature. Opaque glass-ceramics were derived from the K2O-MgO-B2O3-Al2O3-SiO2-MgF2 glasses by the controlled heat treatment at 800°C, and the evolved crystalline phases were identified (XRD) as norbergite (Mg2SiO4.MgF2), clinohumite [Mg7F2(SiO4)3], chondrodite [Mg5F2(SiO4)2], mullite (3Al2O3.2SiO2) and enstatite (MgSiO3). After heat treatment at 950°C, the glasses were converted into fluorophlogopite mica (KMg3AlSi3O10F2) glass-ceramics; and such fluorophlogopite crystallization was enhanced in presence of ZrO2 content. Higher value of thermal expansion coefficient (CTE) is evaluated for these glass-ceramics; and it is ascribed due to the formation of mica crystals. The interlocked type mica containing glass-ceramic microstructure is achieved in such glass-ceramic when contains ZrO2. This directly suggests the usability of this ZrO2 containing K2O-MgO-B2O3-Al2O3-SiO2-MgF2 glass as solid oxide fuel cell (SOFC) sealant.

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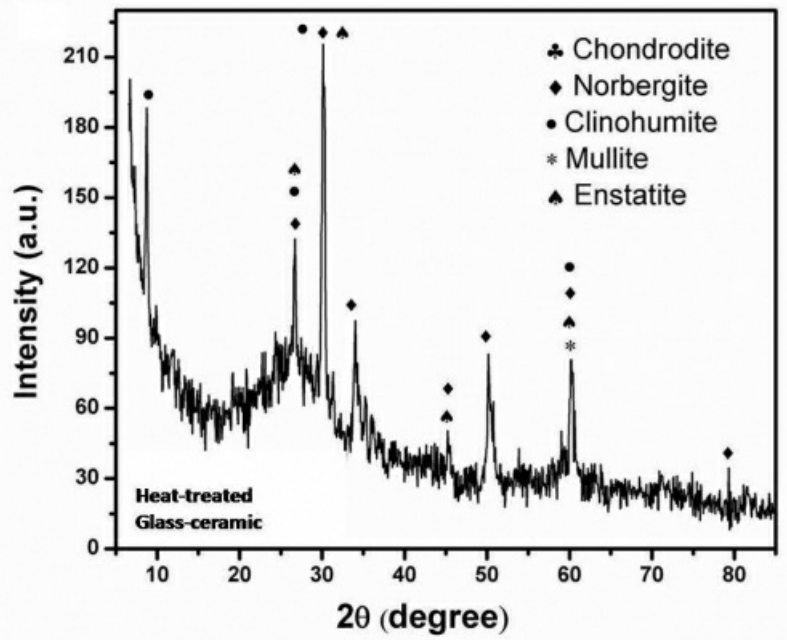

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