Manipulating Crystallization Via ZrO2 Control in Na2O-Al2O3-SiO2 Transparent Nanocrystalline Glass-ceramic

Yu Rao*[1] and Ping Lu†[1]

[1]Wuhan University of Technology – China

Abstract

How to prepare excellent NAS transparent nanocrystalline glass-ceramic remains a challenge, in terms of transmittance, bulk sample, mechanical properties, and other aspects. In this study, we used P2O5 and ZrO2 as mixed nucleating agents, focusing on studying the crystallization process. The presence of ZrO2 separates the crystallization of nepheline and carnegieite crystals. At the same time, a diffusion barrier was formed and the crystal size was limited. We have prepared transparent nanocrystalline glass-ceramics with high optical transmittance of 91%. The hardness of glass-ceramic has a significant increase of compared to untreated glass, increased from 5.18 GPa to 7.15 GPa (increased by 38%). By regulating the crystallization of NAS glass through Zr, the crystal type and size were effectively controlled, which is prerequisite for high mechanical properties and transparency. We hope that this work can provide new ideas and methods for the preparation of transparent NAS glass-ceramics.

Keywords: Transparent glass ceramic, Crystallization

*Speaker

†Corresponding author: lupingwh@whut.edu.cn