

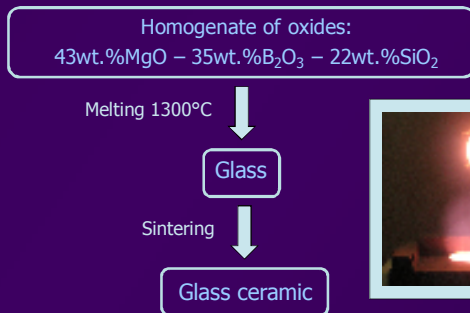
THE SYNTHESIS AND DIELECTRIC PROPERTIES OF THE GLASS-CERAMIC COMPOSITE $MgO-B_2O_3-SiO_2$

Urban Došler, Marjeta Maček Kržmanc, Danilo Suvorov
Advanced Materials Department, Jozef Stefan Institute, Jamova 39, Slovenia
e-mail: urban.dosler@ijs.si

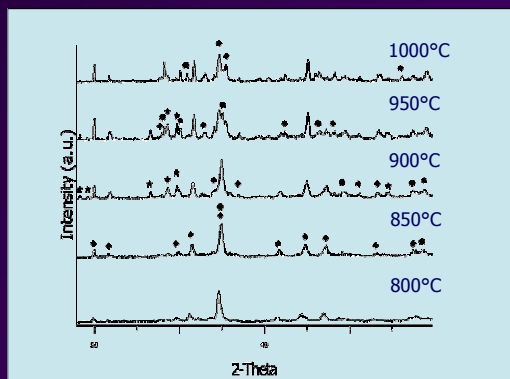
AIM OF WORK

- ★ Preparation of glass and glass-ceramic in the 43wt.%MgO–35wt.%B₂O₃–22wt.%SiO₂ system
- ★ Study of the influence of crystallization and sintering conditions on the dielectric properties
- ★ Determination of the dielectric properties of glass-ceramics

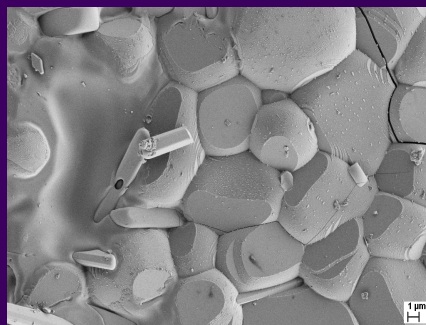
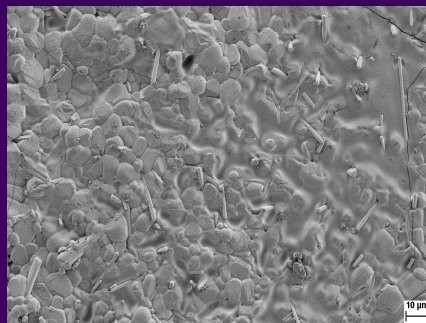
EXPERIMENTAL WORK



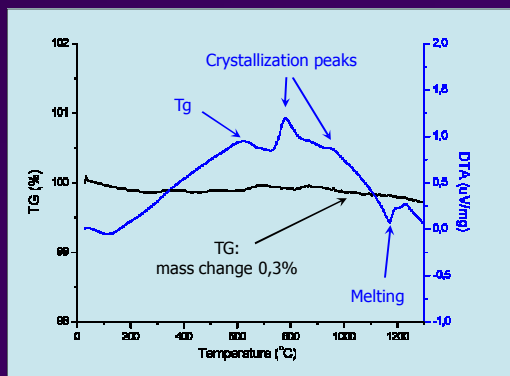
RESULTS



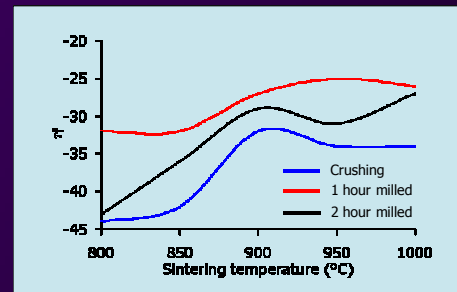
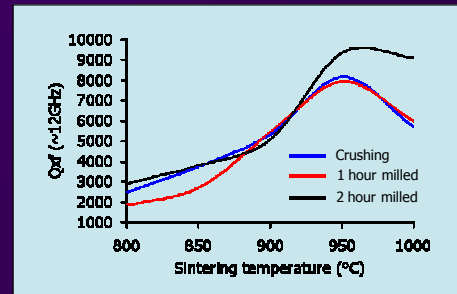
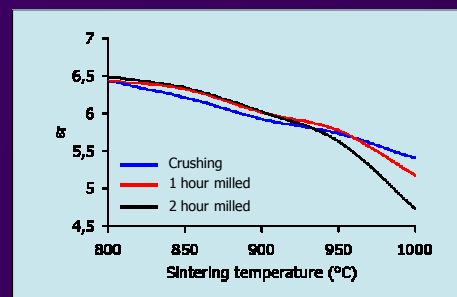
X-ray powder diffraction of the 43%MgO–35%B₂O₃–22%SiO₂ composition. Denotation of the crystalline phases are: ♦ ⇒ Mg₂B₂O₅, • ⇒ MgSiO₃, ★ ⇒ Mg₂Al₄Si₅O₁₈



FE-scanning electron micrographs of the 43%MgO–35%B₂O₃–22%SiO₂ glass-ceramic



TG and DTA curves of 43%MgO–35%B₂O₃–22%SiO₂ glass



Sintering was performed at various temperatures between 800 and 1000°C. The permittivity decreased with an increase in sintering temperature and prolongation of the milling time. Higher sintering temperatures also result in a lower amount of glassy phase, which could be observed in higher Qxf values. The temperature coefficient of resonant frequency (τ_f) was in the range of -45 – -25 ppm/°C.

CONCLUSIONS

- ★ Amorphous glass with the 43%MgO–35%B₂O₃–22%SiO₂ composition was prepared by melting for 1 hour at 1300°C. After cooling to room temperature and subsequent heating to 1000°C the result was crystallized glass-ceramics.
- ★ The amount of crystalline phase increased with the firing temperature and significantly influenced the permittivity and the Qxf values of the investigated glass-ceramics.
- ★ The glass-ceramic with the composition 43%MgO–35%B₂O₃–22%SiO₂ exhibited $\epsilon = 5.6$ and $Qxf = 9,350$ Ghz.
- ★ Such a result qualifies glass-ceramics with the composition 43%MgO–35%B₂O₃–22%SiO₂ for future applications in next-generation technologies.