

### 论文摘要

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## $Y_2O_3$ 含量对 $SiO_2-Al_2O_3-B_2O_3-K_2O-Li_2O$ 系统 微晶玻璃的析晶及性能的影响

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**摘要:** 以 $SiO_2-Al_2O_3-B_2O_3-K_2O-Li_2O$ 为玻璃组成,  $P_2O_5$ 和 $ZrO_2$ 为复合成核剂,  $Sb_2O_3$ 为澄清剂,  $Y_2O_3$ 为添加物, 通过传统熔体冷却方法制得了该系统基础玻璃。利用DSC、XRD、SEM及性能测试等手段, 研究了 $Y_2O_3$ 含量的变化对玻璃析晶行为、析出晶相种类、晶粒尺寸、晶粒分布以及微晶玻璃的力学性能的影响。研究表明: 随着 $Y_2O_3$ 含量的增加, 玻璃的析晶峰值温度升高, 且析晶峰也逐渐变宽、变钝;  $Y_2O_3$ 的加入并不影响微晶玻璃中主晶相的组成, 但对其微观结构有明显影响; 当 $Y_2O_3$ 含量低于2.0%(摩尔分数)时, 微晶玻璃的抗弯强度随 $Y_2O_3$ 含量增加而增加; 当 $Y_2O_3$ 含量为2.0%时, 获得微晶玻璃的抗弯强度值最高, 达到217 MPa; 当 $2.0\% \leq x(Y_2O_3) \leq 2.5\%$ 时, 抗弯强度反而降低; 当 $Y_2O_3$ 含量为2.5%时, 获得的微晶玻璃具有良好的半透明性, 并具有较好的力学性能(抗弯强度为198 MPa); 与一步法热处理相比, 采用两步晶化热处理有利于提高微晶玻璃的力学性能。

**关键字:** 硅酸锂; 微晶玻璃; 析晶; 力学性能; 透明性

## Effect of $Y_2O_3$ on crystallization and property of $SiO_2-Al_2O_3-B_2O_3-K_2O-Li_2O$ system glass-ceramics

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**Abstract:** The  $SiO_2-Al_2O_3-B_2O_3-K_2O-Li_2O$  glass doped  $Y_2O_3$  was prepared by traditional melting quenching method, which introduced  $P_2O_5$  and  $ZrO_2$  as nucleating agent,  $Sb_2O_3$  as clarifying agent and  $Y_2O_3$  as additive. The effects of  $Y_2O_3$  content on the crystallization behavior, crystalline phase, crystal dimensions, crystalline distribution and mechanical properties

of the glass-ceramics were investigated by DSC, XRD, SEM and property measurement. The results show that, with increasing  $Y_2O_3$  content, the crystallization peak temperature rises and the peak band becomes broader and blunter for this system glass.  $Y_2O_3$  has obvious influence on the microstructure, however, it doesn't change the main crystalline phase of the glass-ceramics. When the  $Y_2O_3$  content is lower than 2.0% (mole fraction), the bending strength increases with the increase of  $Y_2O_3$  content. The glass-ceramics containing 2.0%  $Y_2O_3$  has the highest bending strength of 217 MPa. When  $2.0\% \leq x(Y_2O_3) \leq 2.5\%$ , the bending strength decreases with increasing  $Y_2O_3$  content. When  $Y_2O_3$  content is 2.5%, the glass-ceramics has higher bending strength, about 198 MPa, and excellent transparent property. Compared with one-step crystallization heat treatment, the two-step crystallization heat treatment is helpful to improve the mechanical properties of glass-ceramics.

**Key words:** lithium disilicate; glass-ceramics; crystallization; mechanical properties; transparency

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