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热处理制度对 $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ 系统玻璃析晶及热膨胀系数的影响

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摘要: 采用传统熔融冷却法获得了以 P_2O_5 为成核剂的 $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ 系统基础玻璃, 通过差热分析确定了使该玻璃微晶化的热处理条件, 并获得了不同热处理温度下 $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ 系统低膨胀微晶玻璃; 利用X射线衍射分析和扫描电子显微镜对晶化试样的物相和微观结构进行了研究; 讨论了热处理制度对玻璃的析晶及热膨胀系数的影响. 研究表明: 以 P_2O_5 为成核剂, 采用不同热处理制度能获得 $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ 系统低膨胀微晶玻璃; 在析晶初始温度下进行热处理, 析出 β -石英晶体, 但晶体生长缓慢, 结晶程度低; 提高晶化温度, 析出 β -锂霞石和 β -锂辉石晶体且晶体生长迅速.

关键字: $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$; 微晶玻璃; 热处理制度; 低热膨胀系数

Effects of heat-treatment on the crystallization and thermal expansion coefficient of $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system glass

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Abstract: Basic glasses of $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system with P_2O_5 as nucleation agent were prepared by means of conventional melt quenching technology, and the heat-treatment conditions were determined by using DTA. The glass-ceramics with very low thermal expansion coefficient were obtained at different heat-treatment temperatures. The crystalline phases, the microstructure of the glass-ceramics and the influence of heat-treatment on the structure and the thermal properties of the glass-ceramics were investigated according to the X-ray diffraction analysis and the SEM. The results show that the basic glasses in the $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system may be prepared at lower melt temperature and the low expansion glass-ceramics of $\text{Li}_2\text{O}-\text{Al}_2\text{O}_3-\text{SiO}_2$ system can also be obtained at different heat-treatment temperatures. The main crystal phase is β -quartz but this crystal grows slowly at the initial crystallization temperature, while β -eucryptite and β -spodumene grow rapidly at higher heat treatment temperature.

Key words:

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