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热处理制度对Mg-Y-Al-Si-O-N玻璃析晶行为的影响

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摘 要： 分别研究核化温度、核化时间和晶化温度对$Mg_{8.88}Y_{5.92}Al_{10.15}Si_{15.22}O_{52.65}N_{7.19}$(摩尔分数，%)氧氮玻璃析晶行为的影响。此外，还对比研究了两步和一步热处理制度对此玻璃析晶行为的影响。用DSC曲线初步确定玻璃成核和晶化温度范围，再用传统方法确定玻璃的最佳热处理制度；用X-射线衍射仪鉴定微晶玻璃中的物相；用扫描电镜观察微晶玻璃的微观结构。结果表明：对于此组成玻璃，热处理制度严重影响微晶玻璃的析晶度和微观形貌，但对析出相的种类影响较小；所制备的微晶玻璃中均含$YMgSi_2O_5N$(48-1632)、$MgSiO_3$(19-0768)和$Mg_3Al_2(SiO_4)_3$(15-0742)相，其中$YMgSi_2O_5N$为主晶相，呈棒状。

关键字： 热处理制度；Mg-Y-Al-Si-O-N玻璃；晶相；析晶度；显微结构

Effects of heat treatment schedule on crystallization behaviors of Mg-Y-Al-Si-O-N glasses

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Abstract: A glass with the composition of $Mg_{8.88}Y_{5.92}Al_{10.15}Si_{15.22}O_{52.65}N_{7.19}$ (in mole fraction, %) was chosen as parent glass. The influence of nucleation temperature, nucleation time and crystallization temperature on the crystallization behavior of this glass was studied. Furthermore, the effect of one-stage heat treatment on the crystallization behavior of this glass was also investigated in comparison with two-stage heat treatment. The temperature ranges for nucleation and crystallization were both determined by DSC curve of the glass. Based on the DSC curve, the optimum heat treatment schedule was determined by classical method. The crystalline phases in the glass-ceramics were identified by X-ray diffraction. The microstructures of the glass-ceramics were observed by scanning electron microscopy. The results indicate that for this glass, heat treatment has great effects on volume fraction of the crystalline phases and the microstructures of the glass-ceramics, whereas the effect on the type of the crystalline phases precipitated is small. All glass-ceramics contain $YMgSi_2O_5N$(48-1632), $MgSiO_3$(19-0768) and $Mg_3Al_2(SiO_4)_3$(15-0742) phases. Rod-shape $YMgSi_2O_5N$ as the dominant phase appears in all glass-ceramics.

Key words: heat treatment schedule; Mg-Y-Al-Si-O-N glasses; crystalline phase; volume fraction of crystalline phases; microstructure

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