
Phase separation inhibits crystallization of lithium aluminosilicate crystals

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Abstract

The various characteristics of glass-ceramics are determined by the features of its precipitated crystals, and the formation of crystals will be affected by phase separation. However, characterizing the nanoscale phase separation and nucleation mechanisms of glass-ceramics has been a challenge. Here, we present direct evidence that glass phase separation can effectively inhibit crystallization. The nanoscale phase separation in the glass phase prior to formal nucleation and crystallization has been demonstrated by NMR. After the phase separation treatment, the crystallization is greatly inhibited. This phenomenon can be attributed to the preferential migration of O²⁻ and Li⁺ ions towards the phosphorus-rich regions under high-intensity P⁵⁺ ion fields. Consequently, spontaneous phase separation occurs during the cooling process of the melt, leading to an increased degree of aggregation in the silicon-rich region of the glass network. We hope that this work can provide a new idea for controlled crystallization.

Keywords: Phase separation, crystallization, glass, ceramic

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