
Strengthening of Alkali Alkaline Earth Silicate Glasses by Ion-Exchange

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Abstract

This project involves investigation of the effects of changing, ionic species, process time and temperature on the enhancement of mechanical properties by ion-exchange. In the current work, a single-side ion exchange process has been used. In addition to ion exchange involving potassium, equivalent potassium containing glasses have been prepared to deconvolute the effect of potassium on mechanical properties. Other alkali metal ions have also been used for ion exchange to observe the effects of exchanging pair of ions. Observations are made whether the features are a direct consequence of ion exchange or due to the alkali metal species in the glass composition. SEM-EDX has provided concentration versus depth profiles of exchanged ions. FTIR and Raman spectroscopies have been used to investigate the structural differences between ion-exchanged glasses and the glasses that contain potassium. Physical and mechanical property evaluation has also been conducted through four-point bending, microhardness and scratch resistance tests. Nanoindentation has also used to compare hardness and elastic modulus of treated and untreated glass samples. Results and their relationship to the treatment conditions will be compared and discussed.

Keywords: ion exchange strengthening, alkali alkaline earth silicate glasses

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