

N°558 / OC

TOPIC(s) : Alternative technologies / Chemical engineering

Surface hardness and durability reinforcement of silicate glass by thermal poling

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PURPOSE OF THE ABSTRACT

Surface engineering of soda-lime silicate glass has been performed by thermal poling and the correlation between the modification of the glass composition, the local structure and the mechanical properties of the field-induced modified surface has been investigated. Glow Discharge Optical Emission Spectroscopy (GD-OES) demonstrates the multi-layered structuring of the glass surface, due to the migration of mobile cations species. The nature of the atmosphere during poling directly impacts on the charge compensation mechanisms, the multi-layer shape and composition. This work demonstrates the presence of a pure layer of silica beneath the surface of the poled glass under N₂ which strongly increases the mechanical properties of soda-lime glass, especially hardness. The durability of the glass surface has been also improved. The thermal poling treatment is then used to enhance a densification of the poled region and a compressive stress at the silica nanometric layer surface.

FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

glass surface engineering | Thermal poling | chemical composition engineering | glass durability

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