
Scratch groove and ionic packing ratio of oxide glasses

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Abstract

We investigated the composition dependence of scratch resistance within a region of elastic-plastic deformation. A permanent groove eventually associated with the sub-surface lateral cracks was formed on the glass surface by Vickers indenter. The end view of the groove taken with polarized light showed a residual stress concentration at the bottom of the groove. The residual retardation highly depended on the ionic packing ratio and slightly decreased with time. The cross-section profile of the groove showed that residual indentation depth decreased with increasing Young's modulus and pile-up volume was proportional to the ionic packing ratio. These results indicate that the proportional of elastic deformation, plastic flow and densification varies depending on composition.

Keywords: scratch, densification, pile up, plastic flow, ionic packing ratio

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