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Oxygen and silver diffusion into float glass

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Abstract

In the float glass process, molten glass is floated on a molten metallic tin bath, such that tin penetrates the glass surface. Consequently, the glass has distinctly two different faces; the tin-penetrated face (bottom face) and the opposite face (top face). In this paper, the effects of tin on oxygen and silver diffusion into the top and bottom faces of a soda–lime–silica float glass are reported. It was revealed that oxygen diffusion from the atmosphere into the bottom face at temperatures above glass transition temperature was extremely suppressed near the surface region of the glass. This was not observed for the top face. This effect was ascribed to chemical reactions between the diffused oxygen and Sn^{2+} near the surface of the glass. Silver diffusion was also influenced by the tin due to chemical reactions of Ag^{+} ions with Sn^{2+}, leading to the precipitation of nanometer-sized Ag crystals. As a result, the coloration due to the surface plasmon resonance of the Ag crystals was significantly different between the top and bottom faces because of differences in the nucleation and growth processes associated with the Ag crystals.

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