

GRAZING INCIDENCE XRF ANALYSIS OF TIN CONCENTRATION OF GLASS SURFACE

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“Float process” is used to produce a flat sheet of glass where the molten glass is poured onto a molten tin (Sn) bath. Although this method is typical for large flat glass production, Sn residue remains in the produced glass on the surface where the molten glass sits on the tin bath. If the concentration of Sn near the surface of glass is high enough, it causes loss of transparency during post processing such as bending. Therefore, control of Sn concentration near the surface of the glass is necessary to eliminate low quality products. It is known that the concentration of Sn in glass is related to the purity of the tin bath. Therefore, quick purity control of the tin bath is required by monitoring the concentration of Sn in the produced glass. The concentration of Sn in proximity to the glass surface can be determined by dissolving the glass with hydrofluoric acid (HF) followed by analysis with ICP-AES, AAS, ICP-MS or directly with SIMS. All these methods are cumbersome and can take hours to obtain results. A quick and non-destructive analysis method has been demanded for this purpose.

Using a grazing incidence XRF method via the table-top TXRF, NANO HUNTER, we measured Sn-K α lines from six different soda-lime glass samples by irradiating Cu-K α line at a grazing angle of 0.15 deg. This angle is just below the critical angle of the Cu-K α line on the glass surface where total reflection occurs. Therefore fluorescent X-rays are emitted only from a limited penetration depth of several nm near the surface and can be detected effectively.

Relative intensities of Sn-K α lines from the glass samples compare well with the results observed from the HF dissolved ICP-AES process. It has been shown that the non-destructive method of grazing angle XRF is a quick and effective method for the evaluation of Sn concentration near the surface of glass.