TRACKING THE LIQUID PHASE COMPOSITION DURING GLASS MELTING: ANOTHER APPLICATION OF IN-SITU DIFFRACTION

Edward A. Ordway and Scott T. Misture

Industrial CaO-Al_2O_3-SiO_2-B_2O_3 glass batches were studied at temperatures from 900 to 1050°C using in-situ and post-situ XRD. Rietveld quantification of the post-situ samples, including the amorphous content, provides a means of back-calculating the liquid phase composition. Linking the post-situ analysis with the in-situ analysis then provides absolution quantification of the liquid phase during the melting process. The phases encountered include $CaSiO_2$, Ca_2SiO_4, and $CaAl_2Si_2O_8$, that were tracked as a function of time isothermally. In addition to measuring rate constants and activation energies of the growth or decomposition of crystalline phases, we demonstrate that the liquid phase composition can also be determined. Feeding the liquid phase composition into property modeling software (SciGlass) provides a means of determining the average liquid phase viscosity, gas solubility, heat capacity, etc. that can be used in large-scale models of glass melting.