
A new robot-assisted compositional screening method

Stefan Reinsch^{*†1}, Tina Waurischk¹, Felix Arendt², Andreas Diegeler³, and Ralf Müller¹

¹Bundesanstalt für Materialforschung u. -prüfung (BAM) – Germany

²Friedrich-Schiller-University Jena – Germany

³Fraunhofer ISC – Germany

Abstract

The system Na₂O-B₂O₃-SiO₂ (NBS) is the basis of many industrial glass applications and therefore one of the most studied systems at all. Glass formation is possible over a wide compositional range, but the system also contains ranges of pronounced phase separation and crystallization tendency. Despite its importance, experimental data are limited to few compositional areas. The general understanding and modelling of glass formation, phase separation, and crystallization in this system would therefore be easier if small step melt series could be studied. The efficient melting of such glass series is now possible with the new robotic glass melting system at the Federal Institute for Materials Research and Testing (BAM, Division Glasses). Using three exemplary joins within this NBS system, the small step changes of glass transition temperature (T_g), crystallization behavior as well as glass density was studied. Additionally, experimental T_g and density data were compared with their modeled counterparts using SciGlass and a newly developed DFT model, respectively.

Keywords: robotic glass melting, glass transition temperature, density, crystallization, property modeling

^{*}Speaker

[†]Corresponding author: stefan.reinsch@bam.de