Experimental report

22/03/2019

Proposal: 6-05-988 **Council:** 4/2017

Title: Structure of magnesium aluminosilicate glass

Research area: Materials

This proposal is a new proposal

Main proposer: Philip Stephen SALMON

Experimental team: Henry FISCHER
Michela BUSCEMI
Philip Stephen SALMON
Lawrence GAMMOND
Anita ZEIDLER

Local contacts: Henry FISCHER

Samples: (MgO)_x(A2O3)_(0.4-x)(SiO2)_0.6, x = 0.22, 0.30, 0.35
(MgO)_x(Al2O3)_x(SiO2)_(1-2x), x = 0.075, 0.1, 0.15, 0.2, 0.25, 0.275
(MgO)_x(A2O3)_(0.5-x)(SiO2)_0.5, x = 0.28, 0.375, 0.455
(MgO)_x(A2O3)_(0.3-x)(SiO2)_0.7, x = 0.14, 0.17, 0.225
Lithium silica phosphate nano glass in mesoporous silica

Instrument	Requested days	Allocated days	From	To
D4	3	3	15/04/2018	19/04/2018

Abstract:

Mg is a chameleon-like element, which has the ability in oxide glasses to transform its identity from a network former to a network modifier via a change in the Mg-O coordination number. However, little is known about its structural role because it does not lend itself to techniques such as 25Mg NMR. We will use neutron diffraction to make a systematic investigation of the coordination environment of Mg in the model system MgO-Al2O3-SiO2. A wide range of compositions will be covered, the majority of which are compatible with a liquidus temperature that does not exceed 1650 deg C, with the aim of coaxing Mg into playing different coordination roles. The results will be used to improve structure-related models for Mg-containing oxide glass-forming materials that are important in basic science (e.g. geophysics) and technology (e.g. display glass).

Structure of Magnesium Aluminosilicate Glass

The structure of several different glasses in the MgO-Al_2O_3-SiO_2 system was investigated by neutron diffraction. The total structure factors $F(q)$ have been extracted (Figure 1), where q is the magnitude of the scattering vector, and Fourier transformed to give the total pair-distribution functions $G(r)$. These functions are being interpreted with the help of complementary information from ^{29}Si and ^{27}Al solid state nuclear magnetic resonance spectroscopy experiments. In this way, the results are providing new and important information on the composition dependence of the Mg coordination environment.

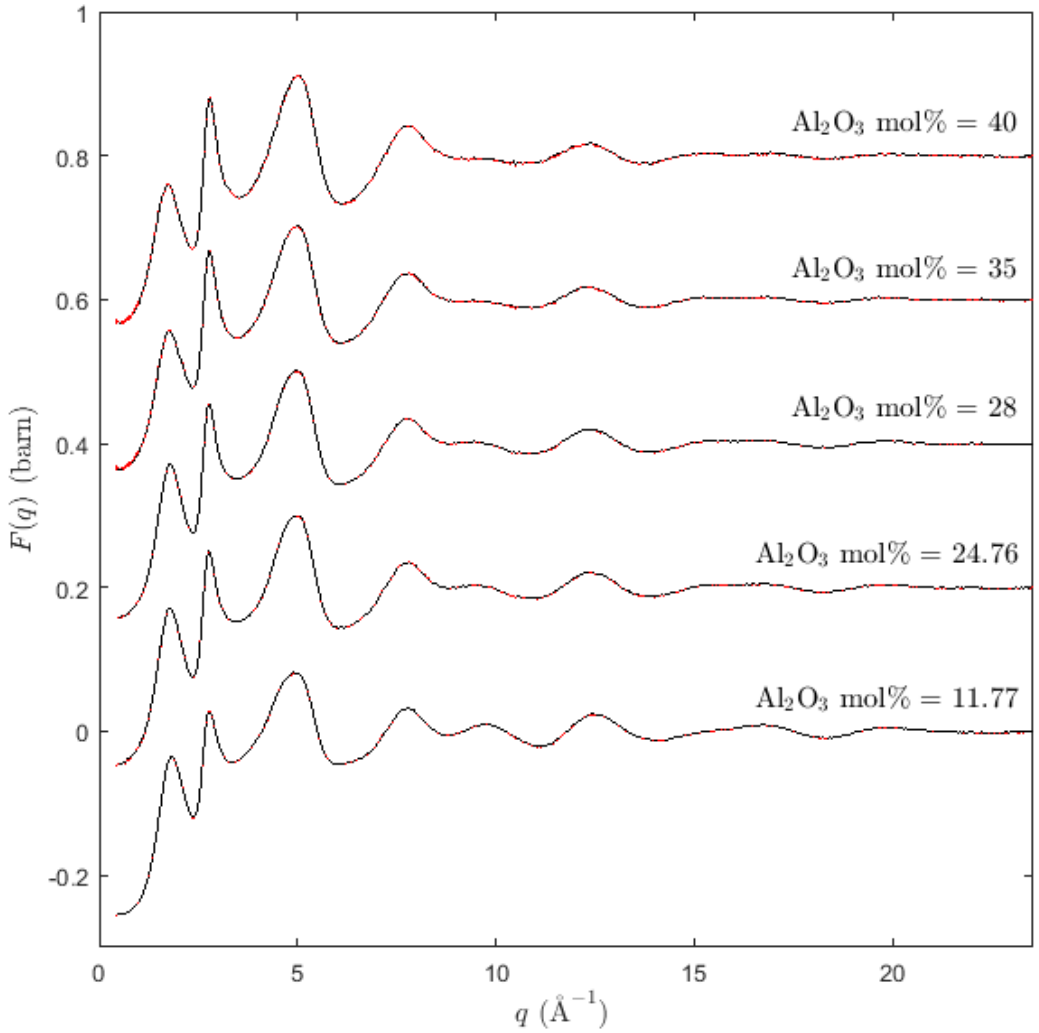

Figure 1. The measured total structure factors $F(q)$ for several magnesium aluminosilicate glasses along the 50 mol% silica tie-line in the MgO-Al_2O_3-SiO_2 ternary phase diagram.