5.4.P02

Structure of tectosilicate and peraluminous glasses in the CaO-Al_2O_3-SiO_2 system

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The concept of fully polymerized glasses for tectosilicate glasses has been recently reassessed with the evidence for excess Non-bridging oxygens (NBOs) in an anorthite $CaAl_2Si_2O_8$ glass [1]. To explain these NBOs and variations in viscosity, the presence of oxygen coordinated to three $(Si,Al)O_4$ tetrahedra, tricluster, has been proposed [2]. Another model suggested the presence of five- ($^{[5]}Al$) or six- ($^{[6]}Al$) fold coordinated species [3]. The structure of tecto- and peraluminous glasses is still poorly known, though high-coordinated species should strongly affect the physical properties of the melt such as density, viscosity, compressibility, heat of mixing

The structure of tecto- and peraluminous glasses in the CaO-Al_2O_3-SiO_2 system has been studied using Raman spectroscopy, X-ray absorption at the Al K-edge, ^{27}Al NMR spectroscopy (9.4T - 400MHz and 17.6 T – 750 MHz) and Molecular Dynamics modeling. Raman and X-ray absorption spectroscopies are sensitive to the network polymerisation and variations in the signal along the tectosilicate join is observed. The local Al environment has been accurately determined in tecto- and peraluminous glasses by careful fitting of the high resolution ^{27}Al NMR data. A significant proportion of $^{[5]}Al$ (7%) is present in tectosilicate and the proportion of $^{[5]}Al$ increases in peraluminous glasses with only minor amount of $^{[6]}Al$. The quantity of $^{[5]}Al$ indicates that no major amount of tricluster is required to explain the presence of NBOs. These experimental results are coupled to Molecular Dynamics simulations to better understand the physical and thermodynamical properties.

References

[1] Stebbins J., Xu, Z. (1997) *Nature* **390**, 60-62.
[2] Lacy, E.D. (1963) *Phys. Chem. Glasses* **4,** 234-238; Toplis M. J., Dingwell, D.B., Lenci, T. (1997) *Geochim. Cosmochim. Acta* **61**(13), 2605-2612.
[3] Mysen B. O., Virgo, D., Kushiro, I. (1981) *Amer. Min.* **66**, 678-701.

5.4.P03

Icelandic magma chambers: Constraints from layered gabbro of the Vesturhorn Igneous Centre

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The Vesturhorn Igneous Centre was emplaced at ~6 Ma into Neogene volcanics of Southeast Iceland. It represents the intrusive root of a large central volcano and consists of a ring complex and granophyre as well as basic intrusives. With the aim to constrain magma chamber processes of central volcanoes we report here on the field relations and petrology of the basic complex visited in the summer of 2003.

The basic complex is composed of gabbroic rocks with anorthitic plagioclase (An70–90) that outcrops over approximately 3 km^2 in the eastern part of the complex [1]. Even though modal layering is generally sparse, it is well developed near the northeastern end in a 300x400m domain. This was reported by Roobol [1] who described 15 size-graded rhythmic units in this sequence, which he attributed to deposition from the influx of primitive basaltic magma loaded with olivine, Ca-poor and Ca-rich pyroxene, and plagioclase phenocrysts.

To further constrain layered gabbro formation, 66 samples were collected in 3 to 4 meters intervals across the 375 m thick stratigraphic section. At least 24 rhythmic units are exposed, ranging in thickness from 40 cm to 25 m, with melanocratic (>60% mafic phases) bases grading upwards into cm-scale layered leucocratic cumulates (>60% plagioclase). The melanocratic bases often truncate the leucocratic tops of the underlying rhythmic units, and include cm-thick leucocratic flakes up to metres long assumed to originate from the underlying unit. The melanocratic rocks consists of cumulus olivine, Ca-poor pyroxene, Ca-rich pyroxene and plagioclase together with intercumulus FeTi oxides, biotite and amphibole oikocrysts. The leucocratic portion of rhythmic units consists of cumulus Ca-rich pyroxene, plagioclase with intercumulus FeTi oxides and biotite.

In the poster we will present the field relations, the petrography, the mineral compositions, and bulk rock compositions of the layered gabbro section. Clearly, the rhythmic units formed in a highly dynamic magmatic environment that may be typical of Icelandic magma chambers and perhaps some oceanic magma chambers.

References

[1] Roobol M.J. (1972) *Geol Mag* **109**(5)**,** 393-404.