

AN EXPERIMENTAL INVESTIGATION INTO THE EFFECT OF CHLORINE ON CRYSTALLIZATION OF A GUSEV BASALT.

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Introduction: High chlorine abundances have been reported on the Martian surface, suggesting that Cl is widespread on Mars. GRS elemental mapping has shown that Cl is not compositionally uniform across the surface of Mars and has a range from 0.2-1 wt% [1]. The MER rovers have confirmed the high Cl concentrations with soil analysis up to 1 wt% Cl [2]. The SNC meteorites also contain numerous alteration products (e.g. siderite, anhydrite, iddingsite, gypsum, carbonate, clay, epsomite, and halite [3-5]). This data suggests that chlorine may be important during Martian magmatic and alteration processes. Therefore, we are conducting an ongoing study to investigate the effects of Cl during crystallization of a Martian magma.

While little is known about the effects of Cl in Martian magmatic systems, much is known about the effects of Cl in terrestrial systems. Chlorine is soluble in terrestrial basalts with a maximum solubility around 3 wt% [6]. Cl is known to form complexes with Ca, Mg, Fe, Al, and P in terrestrial systems, and thus can affect phase relations [7]. However, these relations are highly dependent on melt composition [8] and all current experimental work is on terrestrial compositions. Since no experimental work has been done to investigate the effect of Cl on Martian magmatic compositions, we are conducting high pressure experiments (3-16 kb) on a synthetic Gusev basalt composition with Cl added to investigate the effect of Cl on liquidus and near-liquidus phase relations.

Experimental Strategy: Previous experiments on a synthetic anhydrous [9] and hydrous [10] Humphrey composition are the basis for this study. The same synthetic powder and experimental technique from [9] are being used for this study; however, Cl is added as AgCl which decomposes at temperature to an Ag metal nugget and Cl in the melt.

The ongoing experiments will elucidate the effects of Cl in Martian magmatic systems and help place constraints on the availability of Cl for acidic alteration models.

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