

**THE EFFECT OF Cl AND S ON MINERAL SATURATION  
IN INTERSTITIAL MELTS OF THE CHASSIGNY  
DUNITE: EXPERIMENTAL RESULTS**

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**Introduction:** The higher Cl/F ratio of apatite in the interstices of cumulus olivine grains in the Chassigny meteorite compared with those of apatite within olivine-hosted melt inclusions was ascribed by [1] to re-equilibration of interstitial melt with Cl-rich high T fluids migrating upward from deeper, hotter parts of the magma plumbing system after crystallization of high T pyroxene. This re-equilibration was thought to involve loss of water from the melt to the fluid and gain of Cl by the melt. This appeared consistent with the absence of hydrous phases in the interstitial region, a more ternary feldspar, and absence of low T phases. These characteristics are consistent with lower water content, but the effect of Cl remained unknown. Experiments were designed to assess the effect of Cl on phase equilibria of the residual melt after pyroxene saturation. [3] indicated that a magma of composition similar to the martian hawaiite Backstay [2] may have been parental to the Chassigny meteorite. Furthermore, their experiments indicated that at 1050°C, this composition forms a reasonable proxy to the interstitial melt of the Chassigny cumulus olivine at the stage when fluids may have started to interact. The melt composition at 1050°C was used here for experiments but with a volatile content reflecting fluid/melt interaction in the intercumulus zone: 1.5 wt% Cl, 0.3 wt% S, and 0.4 wt% water.

**Experimental Details:** The starting composition used in the experiments was prepared in 2 stages. First, a Cl-F-S-free hydrous glass was made at 9.3 kbar. This was added to a dry mixture of oxides, silicates, MgCl<sub>2</sub>, MgF<sub>2</sub>, and CaSO<sub>4</sub> to achieve the final desired volatile concentrations. This final starting mixture was loaded into graphite-lined cobalt capsules for crystallization experiments at 9.3 kbar for which the samples were first melted at 1250°C, then dropped to the final equilibration T. All run products were analyzed optically and by EMP and analyses checked for consistency by mass balance computation with IGPET.

**Results:** Unlike the case for low Cl- and low water contents, we observed the suppression of the saturation T of olivine, plagioclase, and amphibole in Cl-rich melts. Olivine is destabilized relative to orthopyroxene.

T (°C)	Cl-, S-free Backstay1050	Cl-, S-rich Backstay1050
1050	Cr-sp + ol + aug + opx + gl	Cr-Al-sp + FeS im. liq. + gl
1000	ol + (pig)+ opx (En58Wo3Fs37) + pl (An37Ab62Or2) + Ti- amph + ap + gl	Cr- sp + opx (En58Wo3Fs39) + ap + pyrr + FeS im. liq + gl
980 (985)	ol + opx (En56Wo3Fs40) + pl (An35Ab63Or2) + Ti- amph + ap + gl	Cr-sp + (pig) opx (En54Wo2Fs44) + pl (An31Ab66Or3) + ilm + pyrr + FeS im. liq + ap + gl
960		opx (En47Wo3 Fs49) + pl (An23Ab74Or3) + pyrr + amph + FeS im. liq.+ ap +gl

**References:** [1] McCubbin F. M. and Nekvasil H. 2008. *American Mineralogist* 93:676-684. [2] McSween H. Y. et al. 2006. *Journal of Geophysical Research* 111: E09S91. [3] Nekvasil H. et al. 2009. *Meteoritics & Planetary Science* 44: 853-869.