GLASS INCLUSIONS IN ALLENDE (CV3) OLIVINE: HEATING EXPERIMENTS.

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Introduction: Glass inclusions represent small volumes of liquids enclosed by a host mineral during its growth. Heating experiments on glass inclusions allow reversing the post-entrapment processes that occurred inside the inclusions during cooling. These experiments - performed on glassy and glass-bearing inclusions in olivine - enable us to obtain information regarding the conditions prevailing during host formation, either in terrestrial or extra-terrestrial rocks [e.g., 1 – 5]. Here we report on the heating experiments performed with glass inclusions in olivine of the CV3 Allende chondrite.

Methods and Results

Heating experiments were performed in a Pt-Pt90Rh10 heating stage at 1 bar pressure in a hot He atmosphere as oxygen getter [6]. The oxygen fugacity is estimated to have been between 10^-9 and 10^-10 atm at 1200 °C corresponding, approximately, to the equilibrium of a mixture of Ar-H2 (1 % H2). Quenching times were less than 1 s. The system was calibrated at the melting point of Au (1063 °C). Runs were performed with a gradual increase rate of temperatures until the final temperature of 1100 °C, 1250 °C and 1450 °C, respectively. The final temperatures were held during two hours (with exception of a second run at 1250 °C which was held during 24 h) after which a rapid quench (less than 1 s to about 500 °C) preserved the final conditions.

The major variations observed in the chemical composition of the heated glass inclusions is an increase of the FeO and MgO contents, with values up to 9 wt% and 19.4 wt%, respectively, as compared with the unheated glasses due to dissolution of the host olivine in the melt. However, glasses seem not to have reached equilibrium with their host showing Kd(Fe/Mg) (olivine/liquid) values ranging from 0.14 to 0.4. Interesting is the content of Na2O in the heated glass inclusions that covers the same range as those in the unheated glasses, with exception of two glass inclusions that were heated to a final temperature of 1450 °C and the glass from the mesostasis (Fig.), which apparently lost Na at that high T.