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Reduced carbonic fluid at magmatic PT conditions: new experimental data.

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We study properties of the dry fluid of C-O-S composition at P=2000 bar and T=900-1000oC. Dry carbonic fluid was generated at the thermal decomposition of $FeCO_3$ and (Fe,Mg)CO_3. At the decomposition of pure $FeCO_3$ assemblages of Wus-Mt and pure Mt was recognized. Wus-Mt corresponds to the fO_2 on the level around QFM-2. Native carbon was formed from the fluid when CO concentration was above constrained by CCO buffer. Generated fluid was trapped as the bubbles within welded albite glass matrix. Micro-Raman study yields around 15 vol.% of CO in the mixture with CO_2. The glass trap composition was interpreted to estimate the minimum solubilities of different elements in the studied fluid: Pt - 15 ppm, Mn – 262 ppm, P – 4100 ppm, Ce –22 ppm, S- 3400 ppm, Sr – 3300 ppm (Simakin et al., 2016). We add sulfur to the system in the form of FeS2, thermally decomposing after carbonates. Fluid interaction with platinum capsule walls to form PtS leads to the fast removal of sulfur. Analysis of the interaction products provides preliminary estimate of the Pt solubility. We observe transformation of magnetite to FeS at the reaction with COS. Pyrrhotite formed from oxide contains in average 1.5 wt.% of Pt. Assuming that at the reaction 1/3Fe3O4+COS+1/3CO = FeS +CO_2 all dissolved in the fluid platinum was incorporated into the sulfide we get minimum Pt solubility of about 5000 ppm. To capture fluid composition we perform experiments in the Au capsules with sodium-silicate glass trap. Micro-Raman shows that presence of water in sodium-silicate leads to the partial COS decomposition to thiols and H2S, however, COS still was prevailing form of sulfur in the fluid as predicted theoretically (Simakin, 2014). Transport of siderophile (Ni, Cr, PGE, Au), LILE (Ba, Cs, Rb, Sr), LREE and chalcophile (Ag, Zn, Cu) elements by the dry fluid of C-O-S composition can be decisive during the formation of different volcanic aerosol phases. Study was partially supported by RFBR-DFG grant # 16-55-12040.

References.

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