Experimental constraints on rhyolite magma genesis, Yellowstone hotspot

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An experimental study was carried out to constrain the phase relations in Cougar Point Tuff (CPT) rhyolite, from the Bruneau-Jarbidge eruptive center [1], representative of the silicic magmatism of the Snake River Plain – Yellowstone (SRPY) volcanic province. Crystallization experiments were performed at 200 MPa in CSPV at 800 and 850°C, and in IHPV at 900, 925 950 and 1000°C with run duration varied from 7 to 25 days. The water activity (aH_2O) of the experimental charges was varied by adding a fluid composed of a mixture of H_2O and CO_2. In CSPV the oxygen fugacity was monitored by adding a solid Ni-NiO oxygen buffer, whereas in IHPV all experiments were conducted at intrinsic oxygen conditions, corresponding to NNO+2.6 under H_2O-saturated and to ~QFM at nominally dry conditions. Water concentrations in the experimental glasses were determined using infrared spectroscopy (FTIR). At 1000°C rhyolitic melt coexisted with magnetite in the range of all studied melt H_2O concentrations (H_2O^m). With decreasing temperature magnetite was followed by the crystallization of sanidine in runs with up to ~ 1 wt % H_2O^m. In nominally dry run (<0.5 wt% H_2O^m) at 950°C and in the runs with H_2O^m < 1.4 wt% at 900°C quartz, pigeonite and clinopyroxene were observed. Fayalite and plagioclase were stable at temperatures below 900°C and H_2O^m < 1.5-2.0 wt %. In these two experimental runs (T=850°C, H_2O^m = 0.3 wt %, H_2O^m = 1.5 wt %) the maximum number of minerals was crystallized, corresponding to multiple saturation conditions of the natural rhyolite. The experimental phase relationships demonstrate that the natural mineral assemblage Pl+Fsp+Cpx+Pig+Mt+ Qtz±Fa was reproduced only in the runs with low H_2O^m (< 1.5 wt%) below 850°C. The low H_2O^m required to reproduce the natural mineral association in CPT rhyolite are in agreement with previous ideas [1-3] on the nearly anhydrous character of the SRPY silicic magmatism. However, our new results (conditions of multiple saturation in CPT rhyolite) contradict with relatively high (950-1000°C) pre-eruptive temperatures obtained as a result of mineral thermometry in previous studies [1,2].

[1] Cathey & Nash (2004) *J. Petrology* **45**, 27-58. [2] Honjo *et al*. (1992) *Bull. Volc.* **54** 220-237. [3] Perkins & Nash (2002) *Geol. Soc. Am. Bull.* **114**, 367-381.

U-bearing quartz veins and related waters from Mondego Sul mine (Central Portugal)

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About 61 uranium mine were exploited in central Portugal in the past. The Mondego Sul open pit mine is located in the Mondego river and produced about 75 t of uranium oxide (U_3O_8) between 1987 and 1991.

At Mondego Sul area, the Variscan coarse- to very coarse-grained porphyritic biotite granite intruded the Cambrian schist-metagraywacke complex, which consists of alternating phyllites and metagraywackes with marble intercalations. The uranium deposit consists of brecciated U-bearing quartz veins which intersect phyllites and are 400 m away from the granite. The U-bearing quartz veins fill faults showing N40-50°W alignment and are subparallel to phyllite cleavage and granite-country rock contact. The uranium mineralization occurs mainly in the interception of this fault system with late N-S faults, but is also disseminated in phyllite. The U-bearing quartz veins contain the U-bearing phases zircon, monazite and xenotime, which occur as inclusions in quartz, muscovite and chlorite. The U-bearing quartz veins also contain the secondary U-phosphates autunite, torbernite, saleeite and uranocircite surrounding Fe oxides-hydroxides along microfractures in several minerals. Pyrite has fractures filled by Fe oxides-hydroxides.

Autunite and torbernite were exploited at the Mondego Sul mine. Tailings and rejected materials (400000 t) were deposited on ground and form three dumps. There has not been any significant development in the area. A lake was formed in the open pit. Ten sampling points were selected, 4 in the pit lake and 6 in the Aguieira dam. Waters from the pit lake are acid (pH = 4.5), have the highest electrical conductivity value (240 µs/cm) and the highest contents of U (131 ppm), SO_4^{2-} (113 ppm) and Mn (0.2 ppm). These waters are of magnesian-sulphated type, whereas waters from Aguieira dam are of mixed type. The abandoned mine is about 10 m away from the reservoir of Aguieira dam. The acid water from the pit lake and dumps flows directly to this reservoir.