

Geology and genesis of silica flour and gold in the Corinna district, western Tasmania

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Silica flour deposits are located in the Corinna district of western Tasmania, where alluvial gold was recovered from 1877 to 1941 (Bottrill *et al.*, this volume). The silica flour deposits occur as pod-like residual bodies overlying Upper Proterozoic dolomite (Turner *et al.*, this volume). The silica flour contains 99.9% pure silica with minor aluminium, iron, calcium and titanium.

The dolomite is a silicified light grey to dark grey rock with a grain size of 20 to 300 μm . It is cut by various sets of quartz \pm carbonate vein networks. The veins consist of early thin veins of milky quartz \pm dolomite (Type I), which were cross-cut by later thicker veins with or without pink carbonates (Type II). Quartz veins with lacy agate (crustiform) texture occur in the area and in places are found in contact with silicified grey dolomite. This veining has been followed by the extensive silicification of the dolomite and disaggregation of the silica flour.

Three major fluid inclusion types are present in quartz at Corinna:

- (1) H₂O-dominated, two-phase, liquid and vapour inclusions which homogenise to liquid upon heating (Type I);
- (2) CO₂-bearing inclusions (Type II); and
- (3) Two-phase, liquid-rich inclusions with variable liquid and vapour ratios (Type III).

The Type I inclusions in quartz veins gave a homogenisation temperature range of 169° to 298°C, whereas the Type I inclusions in the quartz with lacy agate texture yielded homogenisation temperatures from 166° to 263°C. Type III secondary inclusions yielded filling temperatures in the range of 71° to 144°C.

Freezing point depression (T_{m-ice}) of the Type I inclusions gave salinities of 1 to 13 NaCl equiv. wt.%, whereas the Type II, CO₂-rich inclusions gave salinities from 0.2 to 17 NaCl equiv. wt.%. The Type III secondary inclusions gave salinities of 4 to 8 NaCl equiv. wt.%. Decomposition temperature of clathrates (T-clathration) yielded salinities of 10 to 13 NaCl equiv. wt.% for the Type I inclusions 11 NaCl

equiv. wt.% for the Type II inclusions, and 5 to 13 NaCl equiv. wt.% for the Type III inclusions. Preliminary Laser Raman Spectroscopy analysis, using the DILOR MICRODIL-28[®] at the Bureau of Mineral Resources, Canberra, gave a significant proportion of CO₂ (~95 mole %) and minor amounts of CH₄ (~5 mole %) in the gases of the fluid inclusions.

CAMECA microprobe analyses indicate that fineness of gold grains ranges from 890 to 951. The morphology of the gold suggests that the gold grains from the vicinity of the silica flour deposits do not appear to have been transported too far away from their source. The lack of Ag-rich rim in the gold grains from the silica flour area adds support to this interpretation.

Fluid inclusion evidence suggests that the source of the fluids for the silicification was likely to be magmatic (e.g. post-orogenic Devonian granite), although fluids of metamorphic origin cannot be ruled out. The early vein formation is related to higher temperature fluids (~300°C) which passed through the dolomite; dolomite silicification followed at a cooler temperature around 250°C. The late-stage, silica flour formation (disaggregation of the silicified dolomite) relates to the late-stage, secondary inclusions (<150°C).

The close association of silica flour and gold grains in the Corinna area suggests a genetic link, and the gold may have been derived from the same silica flour-forming fluids. The high temperature fluid characteristics (~300°C) in the silica flour samples also suggest that the precious metal could have been transported in the fluids. Gold grains may have been derived from carbonate (dolomite)-hosted, Carlin-type deposits which are yet to be discovered in the area. The enrichment of volatiles (e.g. CO₂, CH₄) in the Carlin-type gold deposits (Pasteris *et al.*, 1986), and in the Corinna district, supports the potential discovery of Carlin-type deposits in the Arthur Mobile Belt.

REFERENCE

- PASTERIS, J. D.; KUEHN, C. A.; BODNAR, R. J. 1986. Applications of the Laser Raman microprobe RAMANOR U-1000 to hydrothermal ore deposits: Carlin as an example. *Econ. Geol.* 81:915-930.