

Geological setting and characteristics of gold-bearing quartz veins in the French Gulch mine, Klamath Mountains, Shasta County, Northern California, USA

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The French Gulch mine is located in the French Gulch-Deadwood gold district in the south-eastern Klamath Mountains, California, as part of the Eastern Klamath terrane. With an approximated production of 800,000 oz (Hotz, 1971) to 1,500,000 oz gold (Clark, 1970) the district developed to the largest gold district of the Klamath Mountains. Three NE-SW to ENE-WSW and one N-S striking and steeply dipping gold-quartz veins crop out in the French Gulch mine. They are hosted by Middle Devonian greenstone and Lower Carboniferous black shales (Albers, 1965). These low-metamorphic units were intruded by Lower Cretaceous monzodiorite to diorite dikes (about 160 Ma) and rhyolite dikes (about 135 Ma) (Silberman and Danielson, 1991; Ross, 2006). Both were intruded by felsic aphanitic dikes and sills of unknown age. The Au-polymetallic-sulfide-quartz veins cut all rock types and used mainly the greenstone-shale thrust-contact and the contact between shale and monzodiorite/diorite dikes. The main gangue mineral of the ore veins is milky quartz which is intergrown with minor amounts of carbonates. Generally, the ore mineralization is bound to wall rock fragments and shear bands. In order of decreasing abundance the main ore minerals are euhedral pyrite, fine crystalline arsenopyrite, subhedral to euhedral galena and sphalerite, and minor chalkopyrite. Gold occurs as free sub-mm grains in quartz or is associated with galena and arsenopyrite. The highest Au contents were measured in veins hosted by black shale (up to 6 oz Au/t). The host rocks of the Au-polymetallic sulfide-quartz veins are intensively altered and show disseminated (Au-rich) sulfide mineralization (mostly pyrite and arsenopyrite impregnation). The most productive Au veins are characterized by high As contents (Danielson and Silberman, 1988; Silberman and Danielson, 1991). The ore veins vary in thickness between a few centimetres to 1 meter. A typical feature of the veins are thin vein-parallel shear bands containing relicts of wall rock (especially black shales) and show partly an extremely enrichment of native Au mineralization. Previous studies (e.g., Albers, 1965; Silberman and Danielson, 1991, 1993) characterized the veins as mesothermal and assumed that the Lower Cretaceous granodioritic Shasta Bally batholite is possibly connected with the gold mineralization. The authors of the present paper postulate an association between the Au mineralization and (sub)volcanic monzodioritic/dioritic dike and stock intrusions in the French Gulch district. Further mineralogical, geochemical, isotope, and age dating analyses of a representative sample suite (151 samples from active and old Au mining sites) which were taken during two field campaigns in March and August 2007 are in preparation.

References

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Abs. No. **312**
Meeting: **DMG 2008**
submitted by: **Geißler, Lutz**
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freiberg.de
date: **0000-00-00**
Req. presentation: **Poster**
Req. session: **S11**