

Native gold and native copper grains enclosed by olivine phenocrysts in a picrite lava of the Emeishan large igneous province, SW China

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ABSTRACT

A native gold bleb found in an olivine phenocryst in a picrite lava from the Emeishan Large Igneous Province (ELIP) may be the first documented case of the transport of gold as a distinct precious metal phase in a mantle-derived magma. Four picrite layers have been recognized in the lower part of the volcanic succession in the Lijiang area, in the western part of the ELIP. The native gold bleb was found enclosed in an olivine phenocryst in the second picritic layer of a basalt-picrite succession in the ELIP. The gold bleb is spheroidal, about 30 μm in diameter, consists of pure gold, and does not contain any other elements. In addition, native copper grains were also discovered in the serpentinized olivine phenocrysts, and native zinc and moissanite (SiC) were separated from an ~20 kg sample of picrite. The paragenesis of these minerals suggests that the primary magmas were S-unsaturated. The native gold and native copper grains are considered to be xenocrysts from the mantle, transported to shallow depths by a rising plume, and then captured by the picritic melts. The discovery of native gold and native copper grains provides direct evidence that the gold in the hydrothermal gold deposits and the native copper deposits in the ELIP lavas ultimately may be derived from a mantle plume.

Keywords: Native gold, native copper, moissanite, mantle plume, olivine phenocryst, picrite, Emeishan large igneous province