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Orogenic vein-type Cu-Au mineralization in the Flatschach area, Eastern Alps

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Vein-type Cu-Au deposits in Flatschach area (Styria) are currently explored by Noricum Gold Ltd. for their gold and copper potential. The NE-SW to NNE–WSW oriented vein system consists of multiple steep-dipping carbonate-quartz veins and is hosted by medium-grade metamorphic rocks of the poly-metamorphosed Austroalpine Silvretta-Seckau nappe. Sericite-carbonate alteration is developed around the veins. Vein formation postdates ductile deformation and Eoalpine peak metamorphism but predates Early to Middle Miocene sediment deposition in the Fohnsdorf pull apart basin. Three ore stages, all gold bearing, are distinguished. Stage 1, the primary hydrothermal (mesothermal?) ore assemblage, is dominated by chalcopyrite, pyrite and arsenopyrite with minor alloclasite, enargite, bornite, sphalerite, galena, bismuth and matildite. Visible gold occurs as inclusions in sulfides, along re-healed micro-fractures or along grain boundaries of chalcopyrite with pyrite or arsenopyrite. Stage 2 ore minerals formed by replacement of Stage 1 sulfides and include digenite, anilite, “blue-remaining covellite” (spionkopite, yarrowite), copper, bismuth and the Cu arsenides domeykite and koutekite. Gold of Stage 2 occurs primarily in the carbonate gangue and less commonly together with digenite, domeykite/koutekite and bismuth. Stage 3 is a strongly oxidized supergene assemblage including hematite, cuprite, and various secondary Cu- and Fe-hydroxides and -carbonates. The Cu-Au deposits in the Flatschach area show several similarities with meso- to epizonal orogenic lode gold deposits but the low-T overprint (Stage 2: 70 to 160°C) with formation of Cu arsenides and sulfides is rather unique.