3–2: The Chelopech high-sulphidation epithermal Cu–Au deposit

Ore deposit: Lat. 42°41' N, Long. 24°05' E

Robert Moritz[a]*, Isabelle Chambefort[a], Silvina Georgieva[b], Stéphane Jacquat[a], Rumen Petrunov[b]

[a] *Earth Sciences Institute, University of Geneva, Rue des Maraîchers 13, 1205 Geneva, Switzerland*

[b] *Geological Institute, Bulgarian Academy of Science, Acad. G. Bonchev St., 1113 Sofia, Bulgaria*

Received 30 November 2004, accepted 21 March 2005

Mining: underground production since 1959 (see Figs. 1, 2 and 3).
Commodities: Cu, Au.
Total of past production + resources: 42.5 Mt @ 1.1%Cu and 3.12 g/t Au.
Type: high-sulphidation epithermal deposit.
Nature of the host rocks: mainly andesite and phreatomagmatic breccia, subsidiary volcanic tuff and sedimentary rock.
Age of andesite host rocks: 91.45 ± 0.15 Ma.
Age of mineralization: <91.45 ± 0.15 Ma.
Alteration: advanced argillic (quartz, kaolinite /dickite, pyrite, APS minerals, Fig. 4), grading into phyllic (quartz–sericite), and distal propylitic. At depth: diaspore, pyrophyllite, alunite and zunyite.
Ore control: fault and lithological controls.
Ore geometry: veins, dissemination, breccia, and massive sulphide lenses with replacement textures.

Main ore minerals: pyrite, enargite, luzonite, chalcopyrite, tennantite, bornite, native gold-electrum, goldfieldite, colusite, digenite, chalcocite, covellite, sphalerite, galena, tellurides.

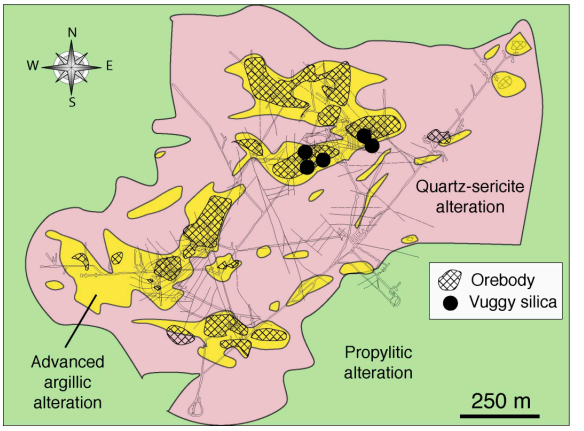

Fig. 1. Horizontal section, level 405.

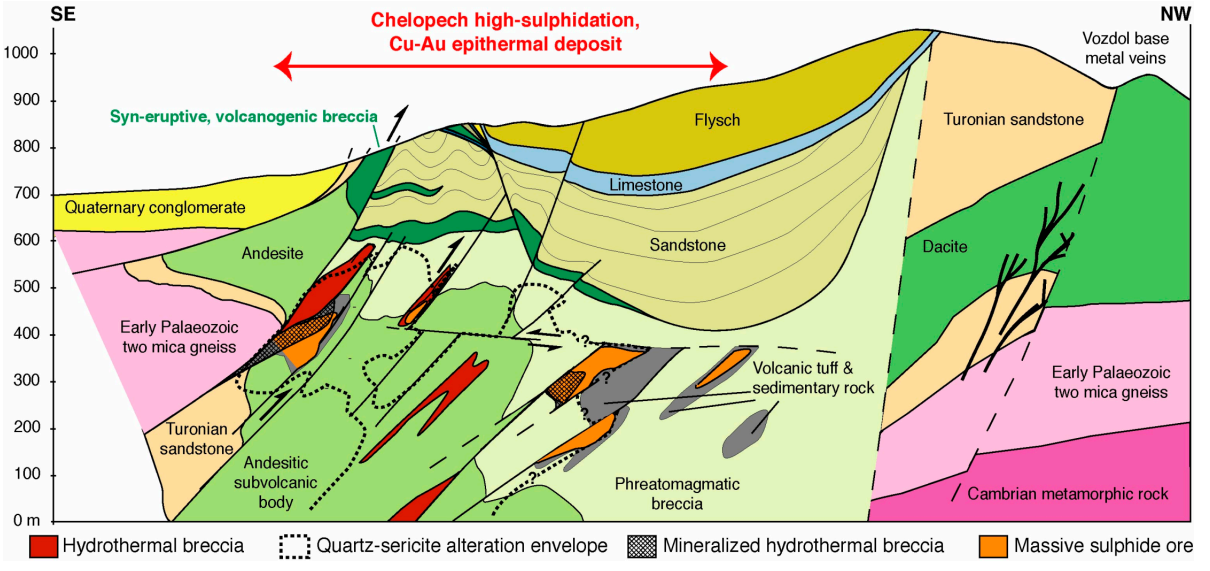

Fig. 2. Cross-section through the Chelopech deposit based on surface and underground mapping, extensive drillcore descriptions and observations, and including information from Popov and Kovachev (1996) for the north-western part at Vozdol. The present mining level is at ~400m. Rock units are Late Cretaceous, unless stated otherwise.

* corresponding author: e-mail Robert.Moritz@terre.unige.ch

doi:10.1016/j.oregeorev.2005.07.021

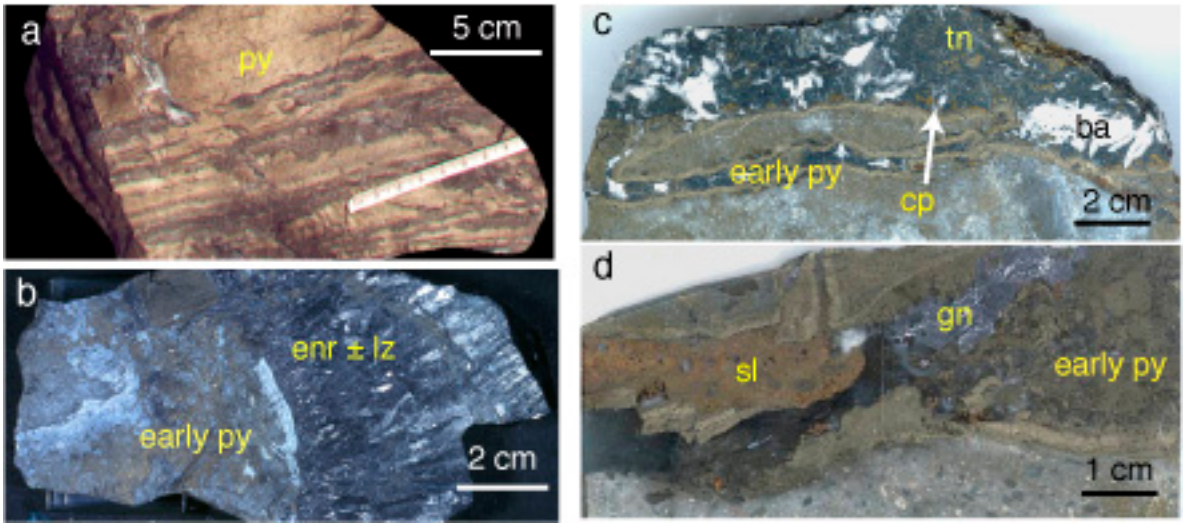

Fig. 3. Typical ore paragenesis, subdivided into three main stages: (a) early massive pyrite (py) stage with a banded texture; (b) enargite ± luzonite (enr ± lz) association of the intermediate Cu–Au–As–S stage; (c) tennantite (tn), chalcopyrite (cp) ± bornite vein of the intermediate Cu–Au–As–S stage; (d) sphalerite (sl), galena (gn) vein of the late base-metal stage, ba: barite. The intermediate Cu–Au–As–S stage constitutes the economic Cu and Au ore.

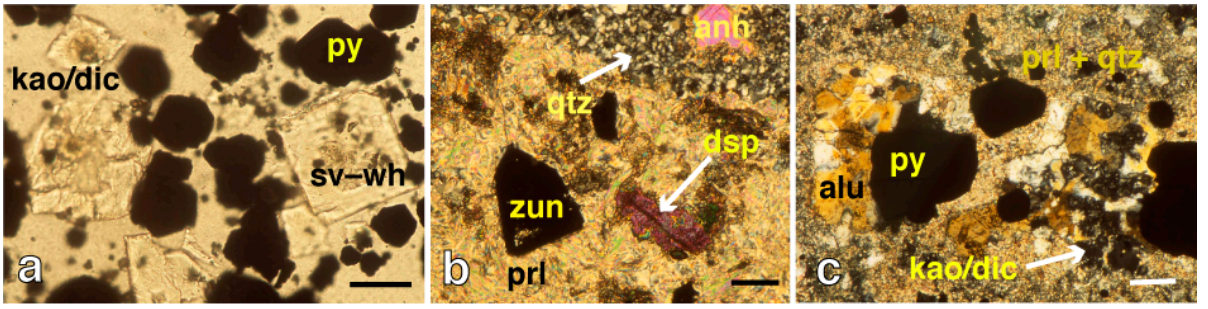

Fig. 4. Advanced argillic alteration assemblage, (a) (plane polarized light): kaolinite/dickite (kao/dic), quartz (qtz), pyrite (py), svanbergite–woodhouseite (sv–wh); aluminium–phosphate–sulphate minerals (APS) alteration at shallow depth (~400 m level, at the present mining level); (b) and (c) (crossed polars): alteration assemblage at depth (~1,000 m level below the present mining level, drillcore observation) including zunyite (zun), pyrophyllite (prl), diaspore (dsp), alunite (alu) and anhydrite (anh). Scale bar = 100 μm.

Key References:

Arizanov, A., Terziyski, S., 2003. The Chelopech Cu–Au deposit. In: Bogdanov, K., Strashimirov, S. (Eds.), Cretaceous porphyry–epithermal systems of the Srednogorie zone, Bulgaria. Society of Economic Geologists, Guidebook Series no. 23, pp. 79–89.

Georgieva, S., Velinova, N., Petrunov, R., Moritz, R., Chambefort, I., 2002. Aluminium phosphate–sulphate minerals in the Chelopech Cu–Au deposit: Spatial development, chemistry and genetic significance. Geochemistry, Mineralogy and Petrology 39, 39–51.

Moritz, R., Kouzmanov, K., Petrunov, R., 2004. Upper Cretaceous Cu–Au epithermal deposits of the Panagyurishte district, Srednogorie zone, Bulgaria. Schweizerische Mineralogische und Petrographische Mitteilungen 84, 79–99.

Petrunov, R., 1995. Ore mineral parageneses and zoning in the deposit of Chelopech. Geochemistry, Mineralogy and Petrology 30, 89–98. (in Bulgarian).

Popov, P., Kovachev, V., 1996. Geology, composition and genesis of the mineralizations in the Central and Southern part of the Elatsite–Chelopech ore field. In: Popov P. (Ed.), Plate Tectonic Aspects of the Alpine Metallogeny in the Carpatho-Balkan Region, UNESCO–IGCP project 356, Proceedings Annual Meeting, Sofia, Bulgaria, 1996, vol. 1, pp. 159–170.