Alunite-Turquoise occurrence from Ali-Abad porphyry copper deposit, Central Iran

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The Ali-Abad porphyry copper deposit is situated in Central Iranian volcano-plutonic arc belt. The oldest rocks in the area are conglomerate and sandstones of Sangestan formation (late Cretaceous). They have been intruded by Oligocene to Miocene porphyrtic granitodis.

The widespread hydrothermal alteration has been taken place in conglomerate and sandstones including: Quartz-sercite, argillic, advanced argillic, silicification and skarn formation. The following mineral assemblage has been detected:

Alunite+ turquoise + pyrite+ sercite+ garnet+ quartz+ goethite + epidote+ calcite+ jarosite

According to field and mineralogical investigations the close associate of alunite-turquoise is well established in alteration zones. Probably, the turquoise is formed in charge of alunite or other Al-rich mineral phase during latest stage of alteration process. It seems that oxidation of sulphide minerals (supergene environment) its responsible for generation of all chemical reactions necessary for alunite-turquoise formation.

[1]Taghipour, B., Moore, F., Mackizadeh, M. A., and Taghipour, S (2013) Hydrothermal garnet in porphyry copper related skarn deposits, Ali-Abad, Yazd Province, Iran, Iranian J. Scie. Tech. accepted paper.

Metal precipitation mechanisms in, "low sulfide," magmatic Cu-Ni-PGE mineralization at Sudbury, Canada: First constraints on oxygen fugacity

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The Sudbury Igneous Complex (SIC), Ontario, Canada, is a large (~60km x 30km), elliptical mass of layered igneous rock situated along the contact between the Superior & Southern provinces of the Canadian Shield. The SIC is widely accepted to have been produced by melting of lower crust and upper crustal veneer due to meteorite impact at ~1850 Ma [1], and is remarkably associated with world-class Cu, Ni & PGE mineral deposits. Along the North Range of the SIC, "footwall-type," deposits are subdivided into sharp-walled vein and low sulfide PGE rich Cu-Ni-PGE mineralization.

Low sulfide mineralization occurs as ≤decimetre-scale blebs, disseminations & stringers of sulfide minerals that generally comprise <3% of any sample and are mined due to their anomalously high concentrations of precious metals compared to other deposit styles at Sudbury. Sulfides in these samples are intergrown with each other, and consist of bornite, chalcopyrite & millerite, and, as a result of their textural equilibrium with a variety of hydrothermal phases (Qtz, Cal, Ep, Chl, Ttn, Grt), are inferred to have precipitated from a hydrothermal fluid.

Hydrothermal garnets, which are rare in the footwall systems, were separated from a sulfide-bearing Qtz-Cal-Ep vein (also containing a CuO phase – tenorite) within the deep 153 ore body at the Coleman Mine and allow constraints to be placed on the formation conditions of low sulfide mineralization in this area of the SIC footwall. Garnets have been studied using include fluid inclusion methods, LA-ICPMS mapping, Lu-Hf/Sm-Nd isotopes and EMP (epidote-garnet equilibria oxythermobarometer) [2]. The results address the chemistry of fluids from which low sulfide mineralization formed, and will constrain P, T & fO_2 – conditions that have not been reported for low sulfide-style mineralization within the SIC footwall.

[1] Krogh *et al*. (1984), *The Geology and Ore Deposits of the Sudbury Structure: Ontario Geological Survey*, 431-447. [2] Donohue & Essene (2000), *Earth and Planetary Science Letters* 181, 459-472.

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