

Natural Fe-Oxidizing Lagoon as a pretreatment in AMD remediation

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A concept called Natural Fe-Oxidizing Lagoon (NFOL) has been developed as an AMD pretreatment to enhance the iron oxidation and remotion processes involved in the natural attenuation of the AMD pollution, by the recreation, at a larger scale, of the iron terraces and pools observed in the Fe-rich AMD systems typically found in the Iberian Pyrite Belt, SW Spain.

The NFOL comprises a first section formed by several preexisting iron terraces followed by a lagoon with a capacity of 100 m³. The AMD pretreated in the NFOL, mean flow of 1.5 L/s, displayed a pH near 3 and contains 275 mg/L Fe (99% Fe (II)), 440 mg/L Zn, 3, 400 mg/L SO₄, 250 mg/L Ca, 100 mg/L Al, 18 mg/L Mn, 5 mg/L Cu and 0.1-1 mg/L As, Pb, Cr, Cd, Co and Ni. The NFOL was built following the recommendations offered by Pyramid Consortium (2003) [1] according to surface area (m²) and inflow (L/s) for lagoons and aerobic wetlands, but facing an inflow Fe concentration 5 times higher.

During the 6 months period of study, the NFOL pretreatment oxidized an average of 65% of the inflowing Fe (II) and precipitated a mean of 38% of total inflowing Fe. Additionally, over 80% of As in the inflow water was retained. Schwertmannite, subsequently aged to goethite, are the minerals responsible for the Fe (III) and As removal. The NFOL showed a mean Fe removal rate as high as 100 g/m²/day, this value is one order of magnitude higher than the common standards for the efficient operation of a lagoon or an aerobic wetland in AMD environments.

NFOL pretreatment can be considered an efficient option to oxidize and remove Fe and As prior to the treatment in the alkaline-based passive remediation system dispersed alkaline substrate (DAS) [2].

[1] PIRAMID-Consortium (2003) University of Newcastle Upon Tyne, Newcastle Upon Tyne UK. [2] Rötting *et al.* (2008) *Appl Geochem* (2008) **23**, 1660–1674.

Skarn bearing clintonite from Kuhe-Dor, Shirkuh, Yazd Province, Iran

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Shirkuh skarns (Kuhe Dor) are located in Cenozoic magmatic belt of Central Iran. There is a diorite intrusion in lower Cretaceous limestone's are detected:

Pyroxene – spinel – clintonite – phlogopite – garnet – vesuvianite – calcite

Kuhe Dor skarn, is characteristic with rare mineral clintonite. Clintonite shows the transition processes from mg – skarn to ca – skarn and is formed in geologic environment with high X H₂O, low X CO₂ and depletion in SiO₂. Content mineral texture evidences show unstable boundaries when clintonite is in contact with spinel. Such petrographic evidence suggests the formation of clintonites at the expense of aluminum rich phase (spinel) is taken place. Skarn formation is started in peak temperature about 800°C.

Due to post Cretaceous intrusions, various marble-skarn mineralization are formed in eastern Shirkuh fault zone. Marbles are made the last zone in contact metamorphic aureole. Marbles are characterized by following mineral assemblages:

brucite+serpentine+forstrite+hydromagnesite+calcite+dolomite.

The marbles are undergone to pyroxene hornfels facies with temperature between 450°C to 600°C (p<2kb). There is three different stages in the formation of marbles; decarbonation, hydration and carbonation which revealed by mineral paragenesis and textures.