# Influence of acid mine drainage on aquatic life at Sar Cheshmeh copper mine

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## Introduction

Investigations on impact of waste dumps on producing of acid mine drainage at Sarcheshmeh copper mine showed a pH range of 3-5.5, which increase the concentration of some toxic heavy metals (Cu, Zn, Pb, As, Cd, Se, Sb …) higher than the permitted standard limits (WHO). In such degraded water some of dominant microorganisms are able to survive. The fungi (*Geotrichum* sp. & *Aspergillus* sp.), bacteria (*Pseudomonas* sp. & *Tiobacillus* sp.) and non-bacterial microorganisms (*green algae*) were recognized in some of acidic drainages. A kind of filamentous green algae, tolerant to acid and high dissolved elements observed. The genus of mentioned algae is *Ulothrix* and species is *Gigas*, without antimicrobial and antifungal properties. These algae are present in drainages with high total dissolved solids (TDS≈1800 ppm) and acid conditions to pH 3.

## Discussion of results

This research suggest the level of acidity, type of dissolved elements and the secondary minerals formed on substrate, all are important factors in distribution of these algae. Field data show the prolific growth of *Ulothrix* between pH 3 – 4.5. The colloidal conditions, in particular the presence of suspended iron and aluminium, prevent the growth of them. Sampling and Chemical analysis of algae for some heavy metals (Cu, Zn, Pb, As, Sb, Cd, Se, Mo) showed the high absorption of some heavy metals (Cu 3500ppm, As 500ppm…) to manifold in comapre with soil and water samples, against their less tendency to absorption of Cd (10ppm). The bacteria especially *Pseudomonas* may strongly impact environmental conditions in acid mine drainages.

## Conclusions

The natural presence of these algae in acid mine drainage is a factor to remove heavy metals in this mine. Further works to determine natural contributions of these algae and bacteria to mitigation of poor water quality is under investigation.

## References

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# Nanometric jarosite/alunite in carbonaceous matter rich cherts: Marble bar drill core (#1 ABDP): Indications for acid-sulfate conditions in a hydrothermal system

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Jarosite/alunite are observed in supergene (sulfate zone of gossans) or in hydrothermal environments [1,2]. These hydroxysulfates, which were also detected on the Martian surface, can be formed abiotically [1,3] or biotically [4]. In the light of this dicussion, carbonaceous matter (CM)-rich Archean cherts (0.5wt $C_{org.}$, 3.5 Ga) from Marble Bar Drill core #1 (~75m depth) were studied. They represent a silt to fine sand-sized volcanoclastic silicified sediments crosscut by micro-quartz veins. CM occurs diffuse or as aggregates in the micro-quartz matrix, in pyrite, associated to Fe-oxides or as patches in quartz veins. The Raman spectra of CM show a crystallinity compatible with a temperature of at least 300°C. The black cherts, S (~3.8 wt.%) and $Fe_2O_3$ (4.8 wt.%) rich, contain pyrite, but also sphalerite, galena, chalcopyrite, Ni-Fe-arsenides and Fe-oxides. Large pyrite grains (~100µm) have irregular rims often characterized by nanometric pyrite spherules. When showing euhedral grain boundaries, pyrite is rimmed by muscovite. FIB-TEM investigations show that these pyrites are composed of nano-poly- and single crystals, containing traces of Ni, As, Pb and variable Si contents. A nanofilm of amorphous carbon occurs at the interface between pyrite and muscovite. Muscovites contain N (550 ppm) and C (250 ppm) and are non-stoichiometric. The non stoichiometry is related to the presence of nanometric Fe-(K-Na)-sulfates (jarosite/alunite) indicating local acidic-oxic conditions. A hydrothermal origin and temperatures of about 300° C for these sulfates is favoured as shown by low-angle boundaries at nanoscale in micro-quartz grains and the maturity of CM.

## References

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