Inferences from a corrosion study of Iron archeological artefacts in anoxic soils

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Mobility of iron in the environment was studied in the nearfield of an archaeological site, an old steel industry from the 16th century located in Normandy (France). This site contains many small ferrous items such as nails which were burried and conserved in an anoxic environment. The presented study is part of an ongoing project aiming at understanding long-term corrosion behaviour of iron in anoxic soils based on a multidisciplinary approach (field investigations, high resolution analyses at the micron scale and geochemical modelling).

First, corrosion products of freshly excavated artefacts have been identified using microbeam techniques (Raman microspectroscopy, X-ray microdiffraction and microfluorescence, EDX-SEM microanalysis): corrosion layers are mostly constituted of both siderite ($FeCO_3$) and an iron hydroxicarbonate ($Fe_2(OH)_2CO_3$) but some magnetite (Fe_3O_4) and sulphur containing layers are also observed.

Concurrently, porewater chemistry and redox conditions were monitored during one year in order to characterise the geochemical conditions of iron archeological artefacts corrosion. Collected data indicate high iron contents which are correlated with both porewater composition (iron carbonate complexes) and redox conditions. Thermodynamics modelling was then carried out using measured parameters.

The aim of this study is to compare thermodynamic modelling with corrosion products analyses. First results indicate a good agreement between both complementary approaches and allow a better understanding of iron behaviour in anoxic media.

Spectroscopic studies on Dergaon meteorite

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We present here the Fourier-transform infrared, Laser-Raman, X-ray fluorescence, and laser-induced spectroscopic investigations of the Dergaon H5 ordinary chondrite in the 10μm (1000cm^{-1}), 20μm (500cm^{-1}) and 0.6μm (6000Å) region. We observed the presence of the first ordered persistent lines in the emission spectra at 5404.1 Å and 5372.8 Å, which is important to Astrobiology. The meteorite sample was crushed into fine powder for analysis, by using agate mortar. The X-ray fluorescence (XRF), and EPMA data on the Dergaon H5 ordinary chondrite were collected as described by Bhandari *et al.* [1], Dhingra *et al.* [2]. Our mineralogical analyses of this meteorite are found to be in good agreement with earlier data of Shukla *et al.* [3]. Raman spectrum is recorded using a Perkin-Elmer System 2000 FT-Raman spectrometer. The fosterite and fayalite compositions are Fo 80 and Fa 19.33 mol % respectively. Pyroxene composition of is approximately Enstatite, En 80 mol % Wo 3 mol %, and Fs 16.9 mol %. The emission band system of Dergaon H5 ordinary chondrite indicates the diffuse nature of emission. The most important features of the emission spectra in the 0.6 μm band region is the presence of nitrogen persistent lines at 5404.1 Å and 5372.8 Å. The bands in the region 5030.8 Å - 5959 Å and 6623 Å - 7503 Å belonging to the first positive band of nitrogen are completely quenched.

[1] Bhandari *et al.* (2005) *Meteoritics & Planetary Sciences* **40**, 1015-1021. [2] Dhingra *et al.* (2004) *Meteoritics & Planetary Sciences* **39**, A121-132. [3] Shukla *et al.* (2005) *Meteoritics & Planetary Sciences* **40**, 627-637.