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Total inhibition of dehydrogenase activity at base metal sulfides mining sites: two case studies from Spain and Tunisia.

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The dehydrogenase activity of a soil is understood as the capacity to transfer hydrogens between organic substrates. This activity depends directly on the quantity and quality of the biological processes that occur in the soil, at a constant temperature, and microorganisms (bacteria and fungi) and roots are the source of it. It is a parameter that is frequently used to assess the potential fertility of a soil and to monitor changes due, mainly, to agricultural management and to the presence of xenobiotics.

In the present work we present data obtained from two cases of study aimed to evaluate the potential fertility of soils affected by the presence of metallic sulfides derived from mining operations. This type of soils suffers different types of alterations, caused by the geochemical reactions generated by the presence sulfides that basically consist on the accumulation of metallic potentially toxic elements (MPTE) above the tolerance thresholds for most of the plants and the formation of sulfuric acid that eventually will affect both surface water (acid drainage) and groundwater (acid leaching).

The case studies were located in South Central Spain (San Quintín Pb-Zn-Ag mine) and in Central Tunisia (Jebbel Troza Zn-Pb mine). Both are decommissioned mine areas, abandoned in the 1980-1990 years without any kind of soil reclamation measures. In both cases, a widespread presence of MPTE in the mine area has been verified, as well as their character of acidic, rich in sulphates and poor in organic matter, as compared to soils located near the area, but not affected by the mining activity.

Our studies have proven that the dehydrogenase activity (DHA) is variable but measurable in the unaffected soils, and null in the affected soils. It seems also interesting to note that is the presence of the PTE, more than the acidification and the presence of sulfates, what produces the inhibition of this enzymatic activity.