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Use of residues of the marble industry for the remediation of soils contaminated by heavy metals

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The major risks due to metal pollution of sediments consist of leaching to groundwater and potential toxicity to animals and/or plants. The objective of this study is to evaluate, by means of an ecotoxicological approach, the effects of the addition of cutting marble sludges on the mobile metal fraction of sediments polluted with heavy metals. The study was carried out on two sediments derived from mining activities in Portman Bay (SE, Spain) polluted with heavy metals. These sediments were studied before and after mixing with sludges left after the cutting of marble, and then lixiviated with water in a programmed way.

For all the lixiviates of raw samples (P1 and P2), the pH values were acidic (mean values of 3.6 and 2.9, respectively).The EC (mS cm^{-1}) was high in the first lixiviates of all the samples, but gradually fell as a result of the washing effect. As regards the metals, the Pb concentration of the lixiviates was not very high due to it being retained in the solid phases, while the higher Zn values were due to its greater solubility and mobility. The soluble Cd concentrations showed a similar trend to the Zn. The results of the bioassay showed that all the lixiviates were sensitive to the test (Microtox®). The toxicity values obtained can be explained both by the presence of soluble heavy metals and by their acidity. The results obtained with the treated sediments (samples mixed with sludges) showed that the addition of marble cutting sludge, consisting mainly of carbonates, to a heavy-metal polluted sediment produces a decrease of available metal forms. The carbonate content seems to play a role in chemical stabilisation of metals and in a decrease of toxicity of sediments. The leached solutions have non-toxic effects. The mild remediation by addition of sludge has moreover effects to long term.