Remediation of jarosite-rich sediments using marble powder and lime. A geochemical study in Portman Bay (SE Spain)

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The objective of this investigation is the study of the geochemical interaction of jarosite-rich sediments of Portman Bay (SE Spain) with waste marble powder (WMP) and lime, paying special attention to the formed minerals. Two types of experiments were performed: (1) mixture of sediments with additions at different ratios and (2) lixiviation columns. Results reveal that the addition of lime mainly precipitated hematite and gypsum and MWP formed ankerite. The elimination of jarosite was nearly complete for the major proportion of lime into the mixture. For MWP mixture, the reaction was uncompleted, remaining more than 50% of jarosite. The amorphous fraction increased notably with the lime treatment in comparison to the calcitic mixture. Results from lixiviation columns showed that lime addition is more effective in the stabilisation of the potential toxic elements. With this treatment Fe, Cu, Zn, Pb and Cr decreased its concentration in more than 80% after 15 days of experiment whereas concentration of Ni and As dropped in nearly 50%.
The effectiveness in the heavy metals stabilisation by lime is due to the precipitation of more stable phases in the form of hydrous ferric oxides, which sorb and co-precipitate considerable amounts of potentially toxic elements. Gypsum precipitation produces a pore clogging that reduces the hydraulic conductivity of the remediated soil.
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