

Improving efficiency of nanomaterials for immobilization of metal(loid)s in soil

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Metal(loid) soil pollution is a worldwide issue due to its harmful effects on human health and ecosystem services. However, total concentration of metal(loid)s in soil is not generally considered a good predictor of the environmental risk. Bioavailability (the fraction of metal(loid) that can potentially be absorbed by living organisms) is becoming a more widely used indicator for managing environmental and human health risks. In this regard, nanoscale zero valent iron (nZVI), owing to its large specific surface area, high reactivity, and environmental benign, has been used successfully to immobilize metal(loid)s in polluted soils. Although nZVI is a powerful reductant, it is also indiscriminate, which reduces its reactive lifetime, and its efficiency depends on metal(loid) characteristics and soil properties. In this sense, recently, sulfidized nZVI has emerged as a material with higher selectivity and lifetime, useful for a wider range of pollutants. On the other hand, recent studies have suggested that nZVI composites with biochar can improve the selectivity and stability of the immobilization processes. In this context, the goal of the present study was to compare the effectiveness of two modified nZVIs to reduce the availability of metal(loid)s in an multi-polluted industrial soil. The use of sulfidated nZVI (SZ), and a composite of biochar and nZVI (BZ) was evaluated in comparison with the use of nZVI (Z) and biochar (B). Soil samples were mixed with each treatment at two doses and kept in incubation at 26 °C for ten days while soil pH and redox potential were monitored. Then, metal(loid) availability was evaluated using TCLP test. The results showed an increase of soil pH and a reduction of redox potential especially for SZ and BZ treatments. Overall, different effectiveness for metal(loid) immobilization was observed among treatments with better results at the highest doses. Concretely, treatments SZ and BZ showed the best results for As and Cd even at the lowest doses. These results are going to be tested in a pot experiment with *Eupatorium cannabinum* plants.

Acknowledgements

PID2023-149788OB-C21 and PID2023-147718NB-I00 (funded by MCIU/ AEI, FEDER, EU), FP-24 RECUPERA (funded by IMIDRA).