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Heavy metals release from urban soils under reducing conditions

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Heavy metals (HM) are typical urban pollutants and often exceed legislative limits in city soils. These limits are usually based on a generic metal total content. However, the threat posed by HM to human health and the environment is thought to be more dependent on their lability than the total content. In particular, reducing conditions could have a strong influence on the release of HM from urban soils and on their mobility. These soils are often sealed, compacted and can be subjected to flooding events, facts that could cause the soils to undergo reducing conditions. The reducible fraction of HM content in soil is often estimate using operational speciation methods such as sequential extraction but little is known about the effectiveness and the real environmental meaning of these methods. To investigate the release of HM from urban soils under reduction and to evaluate the effectiveness of a currently used speciation method, twelve soils from the city of Glasgow, UK, were selected and processed. The soils were characterized, analysed for their pseudototal (*aqua regia* extractable) metal content and for the HM fractionation using the BCR-proposed sequential extraction procedure. The soils were reduced using both a batch and a columns approach, by using a $CaCl_2$ solution under a N_2 flux. Changes in Eh and pH were monitored regularly as well as the release of Pb, Cu, Zn, Fe, $Fe^{2+}$and Mn into solution. The soils were air-dried and analysed one and two months after submersion to investigate re-distribution of HM in the different soil phases as a consequence of the reducing process. Results showed that, despite a quick reduction, HM levels in solution were low, these elements being either not released or immediately re-adsorbed by the soils. The estimation of the reducible fraction made using the BCR-proposed sequential extraction method

seemed to overestimate the amount of metals that could actually be released by the soils when reducing conditions occurred.