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The estimation of different soil components in u speciation

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Heavy metals are persistent pollutants, non-biodegradable, easily accumulated in living organisms even at low concentrations, causing serious illnesses (Dieter, 2011). Soil contamination can create a significant risk to human health. In southern Russia Cu is a priority pollutant. The main objectives of this work were to investigate Cu speciation and to estimate the role of soil components in the fixation of Cu.
An upper (0- to 20-cm) layer of Haplic Chernozem (IUSS Working Group WRB, 2015) occurring far from potential pollution sources was used for the model experiment. Soil was sampled from a reserved virgin plot in the Persianovskaya Zapovednaya Step (south of European Russia). The experimental design included the untreated soil (original uncontaminated soil) and treatment with the addition of Cu at a rate of 2000 mg/kg. Tessier's method (Tessier et al., 1979) was used to assess the distribution of Cu amongst the soil fractions. Tessier's method ensures the separation of five fractions: exchangeable [1 M MgCl2 (7.0)]; bound to carbonates [1 M NaCH3COO (pH 5.0)]; bound to Fe–Mn oxides: [0.04 M $NH_2OH{\cdot}HCl$ in 25% (v/v) CH3COOH]; bound to organic matter [30% H_2O_2 (pH 2)]; 5); and residual (HF+HClO4, then HNO_3conc). In the model experiment, the following components were removed from the untreated soil and the treated soil: organic matter, carbonates, and sesquioxides.
It was established that, a substantial part of the Cu is fixed in the fraction of primary and secondary minerals. In the untreated soil, the organic fraction appreciably contributes to Cu fixation. Organic matter, non-silicate Fe and carbonates compounds are the main components that retain Cu coming into the soil at high pollution.
It was found that, the removal of some or other soil component significantly decreases the content of Cu in the fraction bound to this component. This fact points to the selectivity of the extractants applied for the characterization of Cu bound to soil components in Haplic Chernozem. The mobility of Cu characterized by the first two fractions using the Tessier method (1979) increased by 3–5% after the removal of active soil components (carbonates, sesquioxides, and organic matter).
Thus, in the absence of a soil component, the role of other components in the retention of metal ions increases. When organic matter was removed from the soil, non-silicate Fe compounds become the most active components in metal sorption, and the role of organic matter in metal retention increases in the absence of Fe oxides. Upon the removal of carbonates, the accumulation of metal in the exchangeable form increases significantly.

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