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Effect of protonation and hydrate formation on the displacement of manganese due to complexation from sod-podzolic soils

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Abstract

The physico-chemical properties of the podzolic and sod-podzolic soils studied, the fractional composition of Mn compounds in sod-podzolic soils (P-1-8), the mobility of Mn in sod-podzolic soils from the pH of the medium, the manifestation of the effects of protonation and hydrate formation when Mn-EDTA complexes are formed, the Mn content in the desorbent solution is 0.1n KC1 at different pH of the desorbent medium and the ratio of the amount of manganese displaced from the soils in 5 minutes in % of displacement in 5 days. Organic ligands, forming complexes with Ca, Mg, Fe, Mn, significantly increase the solubility of their sediments and promote their absorption by plants, stimulate their release from the AUC to the solution. The effect of these processes is determined by the stability constants of the complexes formed and the processes of competing complexation in the soil-plant system. The effective stability constant of these complexes depends on the pH and Eh of the medium and the manifestation of the effects of protonation and hydrate formation. Knowledge of the regularities of these processes makes it possible to predict the pH of soils in the taiga-forest zone when water-soluble organic substances of decomposing plant residues act on them, and the use of organic residues together with $CaCO_3$ makes it possible to increase the solubility of $CaCO_3$ and the effectiveness of liming. The formation of manganese complexes with organic ligands allows to eliminate the manganese deficiency for plants on carbonate soils and the excess on gley soils. The rate of transfer of manganese from the soil to the solution carries additional information on the state of the manganese compounds in the soils. Knowledge of the considered regularities is necessary for calculating the ways to optimize the state of manganese on carbionate and gleyed soils.

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