

Properties of humin isolated from Polish arable soils: The most recalcitrant fraction of soil organic matter that prevent soil degradation

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Streszczenie

The purpose of the research was to determine the molecular properties of humin (HUM) determined by elemental composition, as well as spectroscopic ^{13}C Magic Angle Splitting Cross Polarisation Nuclear Magnetic Resonance (^{13}C MAS CP NMR), Fourier transformed infrared, electron paramagnetic resonance and scanning electron microscope energy-dispersive x-ray (SEM–EDX) techniques. Soil samples were isolated from the mollic horizon of Phaeozem and Chernozem arable soils derived from different parent materials in Poland. The HUM was isolated as the fraction that was remined after exhaustive extraction of the humic and fulvic acids by NaOH and was followed by removal of the mineral fraction with HF/HCl treatment. The results obtained indicated that the HUM structures isolated by the adopted method are a chemically heterogeneous conglomerate, composed of a complex of many strongly combined units of organic substances. This fraction indicated a highly condensed structure with a predominance of aromatic components (predominating over chain forms ranging from 7.05% to 10.32%) and hydrophobic reactive moieties. The share of hydrophobic forms ranges from 77.41% to 80.83%. The ash content, ranging from 22.89% to 54.50%, as well as SEM–EDX used indicated that the HUM isolated with the adopted procedure is strongly associated with the mineral components of the soil. The aromatic part of HUM is strongly associated with the mineral components of the soil, what provides their stability in the environment. These observations confirm the high resistance of HUM to decomposition and indicate the great importance of this fraction in carbon sequestration and preventing soil degradation.

Słowa kluczowe

humic substances, Molecular structure, soil organo-mineral complexes, spectroscopic methods

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