

Organic radicals and paramagnetic metal complexes in municipal solid waste composts. An EPR and chemical study.

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Streszczenie

The physicochemical properties of composted municipal solid wastes (MSW) were investigated by chemical and spectroscopic methods (EPR, NMR, IR, UV-Vis, ICP). Transformations of the composted organic matter during 150 days were observed. The water content was controlled in the composts; in some cases the composted MSW were nitrogen enriched by urea addition. The maturation of the composts was observed using standard methods. Quantitative EPR measurements were made on isolated humic and fulvic acids; the concentration of semiquinone free radicals and g parameters were determined. The maximum radical concentration ($1.2 \cdot 10^{17}$ spins/gram) in isolated humic acids was observed in about the 6th week of the composting process in good quality composts. Moreover, distinct linear changes in g parameters of isolated humic acids (HA) from 2.0031 to 2.0037 were observed during the composting process. These changes were correlated to increasing E_4/E_6 ratio characterizing the intensity of the oxidation processes and formation of oxygen-rich functional groups. The heavy metal (Cu, Fe, Mn, Pb) concentrations were examined in the composts and humic (HA) and fulvic acid (FA) fractions. The increase of copper binding by HA extracted from composts enriched in nitrogen was observed; the coordination sites of the ligand were characterized on the basis of EPR spectra. The various Fe(III) and Mn(II) complexes in the HA and FA fractions detected by EPR were used as additional indicators of oxidation-reduction processes in the composts.

Adres publiczny

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