



Changes of heavy metal forms and chlorinated biphenyls during digestion of pre-hydrolyzed sewage sludge

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ABSTRACT

Two digestion processes were conducted: the mesophilic one (as reference system) and the mesophilic one preceded by thermophilic hydrolysis. The production of biogas (methane), was evaluated, as well as the changes in the content of chlorinated biphenyls with codes: 28, 52, 101, 118, 138, 153, and 180, and the changes of heavy metal forms (Zn, Cu, Ni, Pb, Cd, and Cr) in sewage sludge. Higher biogas production, amounted to 1.15 L g⁻¹ of removed dry organic matter was obtained during thermophilic–mesophilic digestion, whereas during mesophilic digestion it amounted to 0.78 L g⁻¹; quantity of methane in biogas during both digestions maintained within the range of 61–65%. Sludge hydrolysis accelerated transitions of polychlorinated biphenyls during the mesophilic methane digestion. Twenty-five percent reduction in the indicator polychlorinated biphenyls (PCB) content after the mesophilic digestion was obtained, whereas after digestion preceded by thermophilic hydrolysis—93% decrease in PCB concentration. Lower chlorinated congeners were dominant in fermented sludge. Proceeding sludge digestion promoted the creation of stable chemical forms of heavy metals. Regardless of applied stabilization process, the highest increase in zinc, copper, nickel, cadmium, and chromium content was demonstrated in organic–sulfide fraction, whereas for lead—in the residue fraction.

Keywords: Sewage sludge; Digestion; Thermophilic hydrolysis; Biogas; PCB; Heavy metals

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