

MICROBIAL DEGRADATION OF POLYBROMINATED DIPHENYLEETHERS IN SEWAGE SLUDGE

MIKROBIÁLNÍ DEGRADACE POLYBROMOVANÝCH DIFENYLEETHERŮ V ODPADNÍCH KALECH

**Jana Zlámáliková 1), Kateřina Demnerová 1), Martina Macková 1), Jana Hajšlová 2),
Jana Pulkrabová 2), Michaela Nápravníková 2), Hana Stiborová 1)**

*1) The Institute of Chemical Technology Prague (ICT), Department of Biochemistry and
Microbiology, Technická 3, 166 28 Praha 6, Czech Republic*

*2) The Institute of Chemical Technology Prague (ICT), Department of Food Chemistry and Analysis,
Technická 3, 166 28 Praha 6, Czech Republic*

Abstract:

Polybrominated diphenylethers (PBDEs) are used as flame retardants although they represent a significant environmental pollution problem. These compounds are structurally similar to polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs) and dichloro-diphenyl-trichloroethane (DDT), therefore their chemical properties are very similar – they are persistent, lipophilic with bioaccumulative properties and resistant to acids, hydroxides and redox reactions. Despite their low acute toxicity, the lower brominated congeners operate as endocrine disruptors, neurodevelopment toxicants and/or carcinogens. PBDE were detected in the air, sediments, sewage sludge, soil or water. Studies have also confirmed their presence in fish, birds that feed on fish as well as in human blood, adipose tissue and breast milk. The aim of our study is expansion of knowledge about microbial degradation of PBDEs.

We have studied aerobic degradation of PBDEs in sewage sludge from Hradec Králové and Modřice. PBDEs decrease was analyzed using gas chromatography with a single mass analyser operated in negative chemical ionization mode (GC-MS/NCI). We have found out that concentration of lower brominated congeners (BDE 28, BDE 47, BDE 49, BDE 66, BDE 85, BDE 99, BDE 100, BDE 153, BDE 154 and BDE 183) decreased by 67,1 % in sewage sludge from Hradec Králové or 29,7 % in sewage sludge from Modřice and concentration of BDE 209 (decaBDE) decreased by 76,5 % in sewage sludge from Hradec Králové or 83,5 % in sewage sludge from Modřice after 11 months of cultivation. We have studied also the ecotoxicity of sewage sludge using bioassays with the seeds of *Lactuca sativa* and bacteria *Vibrio fischeri*. The ecotoxicity of sewage sludge and mineral medium decreased using the bioassay with *Lactuca sativa*, but the ecotoxicity of mineral medium did not significantly change using the bioassay with *Vibrio fischeri*.

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Keywords:

polybrominated diphenylethers (PBDEs), sewage sludge, biodegradation, ecotoxicity