

POLYBROMINATED DIPHENYL ETHERS IN SEWAGE SLUDGE AND EFFLUENTS OF SEWAGE PLANTS FROM A CENTRAL REGION OF GERMANY

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Introduction

Polybrominated Diphenyl Ethers (PBDEs) belong to the group of bromine-containing flame retardants. They are added to materials such as plastics, resins and textiles in percent concentrations to make them flameproof. While in former times also Penta and OctaBDE formulations were used, today mainly the technical DecaBDE is applied throughout Europe^{1,2}.

Meanwhile PBDEs have been found in partly increasing concentrations in a number of aquatic environmental compartments such as river and marine sediments, river water, fishes and mussels^{2,3,4}. Here, mostly the same PBDE components which are present in the technical mixtures are found in the environment. PBDE emissions can punctually take place during the manufacture or processing of the flame retardants and during the disposal and recycling of flame-retarded materials. This, as a rule, should lead to local contamination but cannot explain the meanwhile wide spread of these flame retardants in the aquatic environment. Therefore, we have to have a closer look at possible further sources.

Examinations of municipal sewage sludges in various European countries have shown that PBDEs can be present in up to the higher ppb concentration level^{4,5,6}. Here as well, mainly the same Tri to DecaBDE components were found as in technical products. The PBDEs reach the sewage plants via the municipal waste water. Their sources, however, are not clarified. During sewage sludge treatment the PBDEs should remain bound to the sewage sludge due to their physico-chemical properties with increasing tendency from the lower to the higher brominated diphenyl ethers. The sewage sludge should be a PBDE sink in case it is disposed of in a way that destroys (e.g. by combustion) or immobilises (e.g. by waste disposal) the PBDEs. If the sewage sludge is spread on the field as fertiliser in order to improve the soil, the PBDEs will remain available for the environment. Besides, PBDEs can also be released into the aquatic environment via suspended particulate matter from sewage plant effluents. This should be verified in the present examination.

Thus, the sewage sludges and suspended matter from the effluents of 8 municipal sewage treatment plants from a central region of Germany were examined for their PBDE content. The analyses included the quantitation of Tri to DecaBDE under congener-specific determination of components which are typically present in technical PBDE products. This paper reports on the applied method of analysis and presents the PBDE data for the sewage sludges and the respective sewage plant effluents.