

ASPECTS ON POLYBROMINATED DIPHENYL ETHERS AS INDOOR, OCCUPATIONAL AND ENVIRONMENTAL POLLUTANTS

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A total picture of PBDE as a pollutant

A total picture in respect to the PBDEs' characteristics as indoor, occupational and environmental pollutant; analytical performances, intercalibration studies, reference materials, QA/QC and on-going regulatory actions in order to limit pollution is given.

Aspects on polybrominated diphenyl ethers, PBDEs, as indoor, occupational and environmental pollutants are first presented in view of the current observations of their sources, diffusions and final appearance in biota including humans.

Determinations of levels of PBDE in different occupational settings and environmental compartments have been carried out during the 80's and 90's. The various PBDE compounds and their metabolites have been confirmed to be ubiquitous environmental pollutants. Their abiotic transformations and toxicokinetic behaviour have been studied and their toxicity tested. Time-trends of levels in various locations and species are currently being established. Varying regulatory measures are being taken in several countries to out-phase their use.

How have the chemical analytical challenges been met and will they be suitable in the monitoring following the out-phasing? What are the analytical procedures and QA/QC guidelines like for determination of these compounds? What is the analytical state-of-the-art today? What more is there to be considered about the technospheric spread, the chemical properties, past and present use and life-cycle of these pollutants?

PBDE as indoor pollutant

Exposure pathway - by inhalation

Studies on concentrations in indoor air have been carried out in lecture halls, computerised indoor environments and rooms with other electronic devices, such as TV sets. The indoor exposure by inhalation is relatively small compared to other exposure path-ways. But, potential point sources can lead to elevated indoor exposures.

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Indoor and Occupational Pollutants

Analytical considerations: For determinations of the general background levels and elevated background levels in air and particles determinations at a MDL of pg/m^3 are required.

PBDE as occupational pollutant

Exposure pathway - by inhalation and skin uptake

Persons with an occupational exposure to specific technical PBDE formulas have been identified at plants for dismantling electronics. Individuals potentially exposed in their occupational environment have been studied in relation to their work as drivers, farmers, cleaners, actors and monitor repairers.

Analytical considerations: Air, dust, surface and various materials' including biological tissues' monitoring and analyses at ppt to ppb level are required. Pattern recognition, profile and transformation analyses of congener specific data can reveal exposure sources.

To be considered: Analytical data generated must be of comparable quality for the different matrixes for optimal interpretations. The pore correlation with age and levels of other persistent halogenated pollutants in human tissues may indicate that there are unidentified point sources of occupational exposure or other sources not related to food pollution. Also a rapid transformation by debromination of higher brominated congeners to lower brominated ones alters and blurs the original PBDE profile.

PBDE as environmental pollutant

Exposure pathway - food-chain

Humans. Food is the main exposure for humans. Detectable to high levels are found in foodstuff, meats, cheese, butter and margarine as well as in fish and sea-food. Levels found in blood and adipose tissue in individuals and different populations show that there is a general human background pollution of PBDE at a low ppb level, on lipid bases. Levels in human milk in Sweden show an exponentially increasing trend since the 70's, and the perinatal exposure to babies has doubled every fifth year.

Biota. High levels, ppb-ppm, have been found in several species of marine mammals, fish and other aquatic biota. The PBDE pollution of marine mammals is greatly affected by lactation transfer from the females to the off-spring. Environmental data is most abundant from Sweden, The Netherlands, Japan and the US. Increased biotic pollution is observed in the vicinity of industrial activity such as textile and polymer industry.

Analytical aspects: Due to the relatively high levels analyses of PBDE in biological tissues can be carried out at MDLs of ppb on lipid basis.

