

## RAPID, SENSITIVE DETECTION OF POLYBROMINATED DIPHENYL ETHERS BY GAS CHROMATOGRAPHY COUPLED TO ICP-MS

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Polybrominated diphenyl ethers (PBDEs) are common flame-retardants added to many household products and electronics devices. These chemicals can enter the environment through the dust and residue from such products or into groundwater through landfill seepage. Similar to polychlorinated biphenyls (PCBs) and dioxins, PBDEs have been shown to be persistent, bioaccumulative and toxic. While two of the three commercial PBDE products have been recently banned in Europe and parts of the US, they are ubiquitous in the environment. Levels in breast milk from North American women are doubling every 2-5 years and are approaching concentrations known to cause thyroid and neurological damage in laboratory animals.

Gas chromatography (GC) combined with inductively coupled plasma mass spectrometry (ICP-MS) can be applied to the analysis of PBDEs. ICP-MS offers high sensitivity plus absolute selectivity between the halogens, suffering no interference from fluorine, chlorine or iodine. Because there is no suppression or enhancement of response from co-eluting compounds typical of some elemental detectors, a wider range of GC carrier gas options and flows can be tolerated, greatly increasing the chromatographic flexibility. The powerful ionization source provides Compound Independent Calibration (CIC), useful for the quantification of compounds for which standards are expensive or unavailable such as many PBDE congeners.

There are 209 different PBDE congeners and many are notoriously difficult to measure because they decompose at relatively low temperatures. The most difficult is the “Deca” congener that is particularly sensitive to thermal decomposition in the gas chromatograph. In this work we will describe the use of a novel 2dimensional (2D) GC approach to solving the problems with on-column separation of the heavier PBDE congeners combined with ICP-MS detection. Development of the method strategies will be discussed and illustrated using detailed results and full figures of merit.