

Levels and profiles of legacy and emerging PFRs in car dust from Greece

Christia C^{1,2}, Covaci A¹, Basis A², Samara C², Poma G¹

1-Toxicological Center, University of Antwerp, 2610 Wilrijk, Belgium

2-Environmental Pollution Control Laboratory, Aristotles University, 54124 Thessaloniki, Greece

Indoor dust acts as repository material for organic compounds and has been identified as a significant route of human exposure to flame retardants (FRs)[1,2]. Organophosphate flame retardants (PFRs) and emerging PFRs (ePFRs) have already been detected in indoor dust (mainly in homes and offices). Less studies focused on the investigation of FRs in cars and the information of possible health risk is still limited [3]. PFRs in car dust expected to be one order of magnitude higher than home dust and approximately at same order of magnitude with office dust [4]. The information for ePFRs is still not comparable. High concentrations are due to their leaching out of different types of polymers that are used in the interior of automobiles [5].

The present study reports on new data for Greece investigating the levels and profiles of seven target PFRs: tris(2-ethylhexyl) phosphate (TEHP), tris(2-chloroethyl) phosphate (TCEP), tris(2-butoxyethyl) phosphate (TBOEP), triphenyl phosphate (TPHP), 2-ethylhexyl diphenyl phosphate (EHDPHP), tris(1-chloro-2-propyl) phosphate (TCIPP), tris(1,3-dichloro-2-propyl) phosphate (TDCIPP) and four target ePFRs; 2,2-bis(chloromethyl)propane-1,3-diyltetrakis(2-chloroethyl)bisphosphate (V6), isodecyl diphenyl phosphate (iDPhP), resorcinol bis(diphenyl phosphate) (RDP) and bisphenol A-bis(diphenyl phosphate) (BDP) in car dust. The samples were collected from the interior of 25 private cars in Thessaloniki, Greece, with different years of manufacture (1997-2015) and continents of origin (EU, n=13; Asia, n=9; USA, n=3). The method used for the analysis of the target compounds included ultrasonic extraction and Florisil fractionation. PFR analysis was carried out by GC-EI/MS, whereas ePFRs were analyzed by LC-MS/MS.

The levels of Σ_7 PFRs varied from 2,034 to 189,962 ng/g, with mean and median concentrations of 19,784 and 6,630 ng/g, respectively. The concentrations of Σ_4 ePFRs ranged from 44 to 8,682 ng/g, with mean and median values at 1,113 and 193 ng/g, respectively. TCIPP and TDCIPP were the dominant PFRs in dust from European and Asian cars. TCEP was the dominant PFR in the American cars. V6 was the dominant ePFR only in dust from European cars, whereas iDPhP was detected in higher concentrations in dust from Asian and American cars. No correlation was observed between the age of the car and the (e)PFR levels.

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