**Influence of particle size and total organic carbon on the distribution of polybrominated diphenyl ethers in landfill soils: Assessment of exposure implications**

E. Akortia\*a, b, M. Lupankwaa and J.O. Okonkwoa,

aEnvironmental Chemistry Research Group, Department of Environmental, Water and Earth Sciences, Tshwane University of Technology, Private Bag X680, Pretoria, South Africa.

bGhana Atomic Energy Commission, Radiation Protection Institute, P. O. Box LG 80, Legon, Accra, Ghana.

\*Corresponding author: Email (Sericuk@yahoo.co.uk; eakortia@gmail.com)

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**SM 2 FIGURES**

Figure S1: Particle size distribution in landfill site soils using Microtrac S3500 particle size analyser.

**Size selection strategy calculations:**

Common size fractions often employed for chemical analysis:

≤250 µm, <150 µm, <75 µm, and <50 µm

Using equation 1: (Refer to main text)

$C\_{Est. =}\frac{\sum\_{}^{}C\_{f}W\_{f}}{\sum\_{}^{}W\_{f}}$ (**1)**

For example, for each sample, *Cf Wf* refers to the absolute amounts estimated for total PBDE burdens in Tables S3 and S4.

Therefore, *CEst.* equals to the sum of the respective concentrations for each sample.

≡ *CEst.*= ∑(*Cf1, Cf2, Cf3*… *Cf6*)

From Tables S3 and S4; *CEst*. (150‒250 µm) = 49.7 ng g-1 and *CEst*. (45‒150 µm) = 45.1 ng g-1

For the percentage difference in concentration, we focused on two cases, i.e. A and B corresponding to the soil aggregates evaluated. Using the smallest size fraction as the bench mark (45‒150 µm), it was hypothesised that the ultra-fine particle would be more prone to exposure. Therefore, case A corresponds to 45‒150 µm, whereas case B corresponds to 150‒250 µm aggregates. Thus, the percentage difference in concentration between case A and case B can be estimated as:

$$∁\left(\%\right)=100×\frac{C\_{caseA}-C\_{caseB}}{C\_{caseA}} (2)$$

≡ Case A = 45.1 ng g-1 Case B = 49.7 ng g-1

≡ C (%) = -10.1

≡ Case B exceeded case A (benchmark) by a 10% margin.

**SM1 Tables**

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| Table S1 Descriptive statistics of PBDE quantities (ng g-1) in the landfill soils (150‒250 µm fractions). |
| CONGENERS | Mean | SD | CV | Median | Min | Max |
| BDE-28 | 0.396 | 0.00182 | 0.00460 | 0.395 | 0.393 | 0.398 |
| BDE-47 | 0.439 | 0.732 | 1.67 | 0.0659 | 0.000 | 1.84 |
| BDE-100 | 1.12 | 0.506 | 0.451 | 0.922 | 0.787 | 2.11 |
| BDE-99 | 1.14 | 0.682 | 0.597 | 0.795 | 0.787 | 2.50 |
| BDE-154 | 1.58 | 0.00728 | 0.00460 | 1.58 | 1.57 | 1.59 |
| BDE-153 | 1.60 | 0.0537 | 0.0334 | 1.58 | 1.57 | 1.71 |
| BDE-183 | 2.00 | 0.0538 | 0.0269 | 1.98 | 1.97 | 2.11 |
| ∑7BDEs | 8.28 | 2.04 | 2.79 | 7.32 | 7.08 | 12.3 |
|  |   |  |  |   |  |   |

SD=Standard deviation; CV=Coefficient of variation; Min=Minimum; Max=Maximum

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| Table S2 Descriptive statistics of PBDE quantities (ng g-1) in the landfill soils (45‒150 µm fractions). |
| CONGENERS | Mean | SD | CV | Median | Min | Max |
| BDE-28 | 0.397 | 0.000974 | 0.00245 | 0.397 | 0.396 | 0.399 |
| BDE-47 | 0.0443 | 0.108 | 2.45 | 0.000 | 0.000 | 0.266 |
| BDE-100 | 1.10 | 0.482 | 0.436 | 0.861 | 0.792 | 1.99 |
| BDE-99 | 0.816 | 0.100 | 0.123 | 0.795 | 0.661 | 0.930 |
| BDE-154 | 1.59 | 0.00389 | 0.00245 | 1.59 | 1.58 | 1.59 |
| BDE-153 | 1.59 | 0.00389 | 0.00245 | 1.59 | 1.58 | 1.59 |
| BDE-183 | 1.99 | 0.00487 | 0.00245 | 1.98 | 1.98 | 1.99 |
| ∑7BDEs | 7.52 | 0.704 | 3.02 | 7.21 | 7.00 | 8.77 |

SD=Standard deviation; CV=Coefficient of variation; Min=Minimum; Max=Maximum

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| Table S3 PBDEs load in sieved soil 150‒250 µm  |  |
| Soil (n=6) | Mass (g) | Conc. (ng g˗¹) | Absolute amounts | Percent contribution |
| S1 | 5.09 | 7.08 | 36 | 14.3 |
| S2 | 5.02 | 7.57 | 38 | 15.1 |
| S3 | 5.06 | 7.12 | 36 | 14.3 |
| S4 | 5.07 | 10.8 | 54.7 | 21.8 |
| S5 | 5.06 | 9.22 | 46.7 | 18.6 |
| S6 | 5.04 | 7.93 | 40 | 15.9 |
| C(est.) |  | 49.7 | 251 |  |
| C(est.)= Sum concentration of PBDEs in each sample |

|  |  |
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| Table S4 PBDEs load in sieved soil 45‒150 µm |  |
| Soil (n=6) | Mass (g) | Conc. (ng g˗¹) | Absolute amounts  | Percent contribution |
| S1 | 5.04 | 7.01 | 35.3 | 15.5 |
| S2 | 5.04 | 7.68 | 38.7 | 17.0 |
| S3 | 5.05 | 7.13 | 36 | 15.8 |
| S4 | 5.03 | 7.29 | 36.7 | 16.1 |
| S5 | 5.02 | 8.77 | 44 | 19.4 |
| S6 | 5.04 | 7.27 | 36.7 | 16.1 |
| C (est.) |   | 45.1 | 227 |   |
| C(est.)= Sum concentration of PBDEs in each sample |

Table S5 Certified and measured concentrations (ng g-1) of certified reference material (NIST SRM 2585-Organic contaminants in house dust)

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| Congener | Measured (n=3) | Certified | Recovery (%) |
| BDE-17 | 104 ± 4.1 | 115 ± 1.2 | 90 |
| BDE-28 | 40 ± 1.0 | 46.9 ± 4.4 | 85 |
| BDE-47 | 463 ± 9.0 | 497 ± 46 | 93 |
| BDE-100 | 146 ± 3.5 | 145 ± 11 | 101 |
| BDE-99 | 628 ± 0.08 | 892 ± 53 | 70 |
| BDE-154 | 73.3 ± 0.7 | 84 ± 2 | 88 |
| BDE-153 | 85.3 ± 0.8 | 119 ± 1 | 72 |
| BDE-183 | 47.6 ± 4.5 | 43 ± 3.5 | 111 |
| BDE-209 | 2082 ± 11 | 2510 ± 190 | 83 |

**SM 2 Figures**



Figure S1 Particle size distribution in landfill site soils using Microtrac S3500 particle size analyser.