Determination of per- and polyfluorinated substances (PFAS) in landfill leachate using solid-phase extraction with three different sorbent materials

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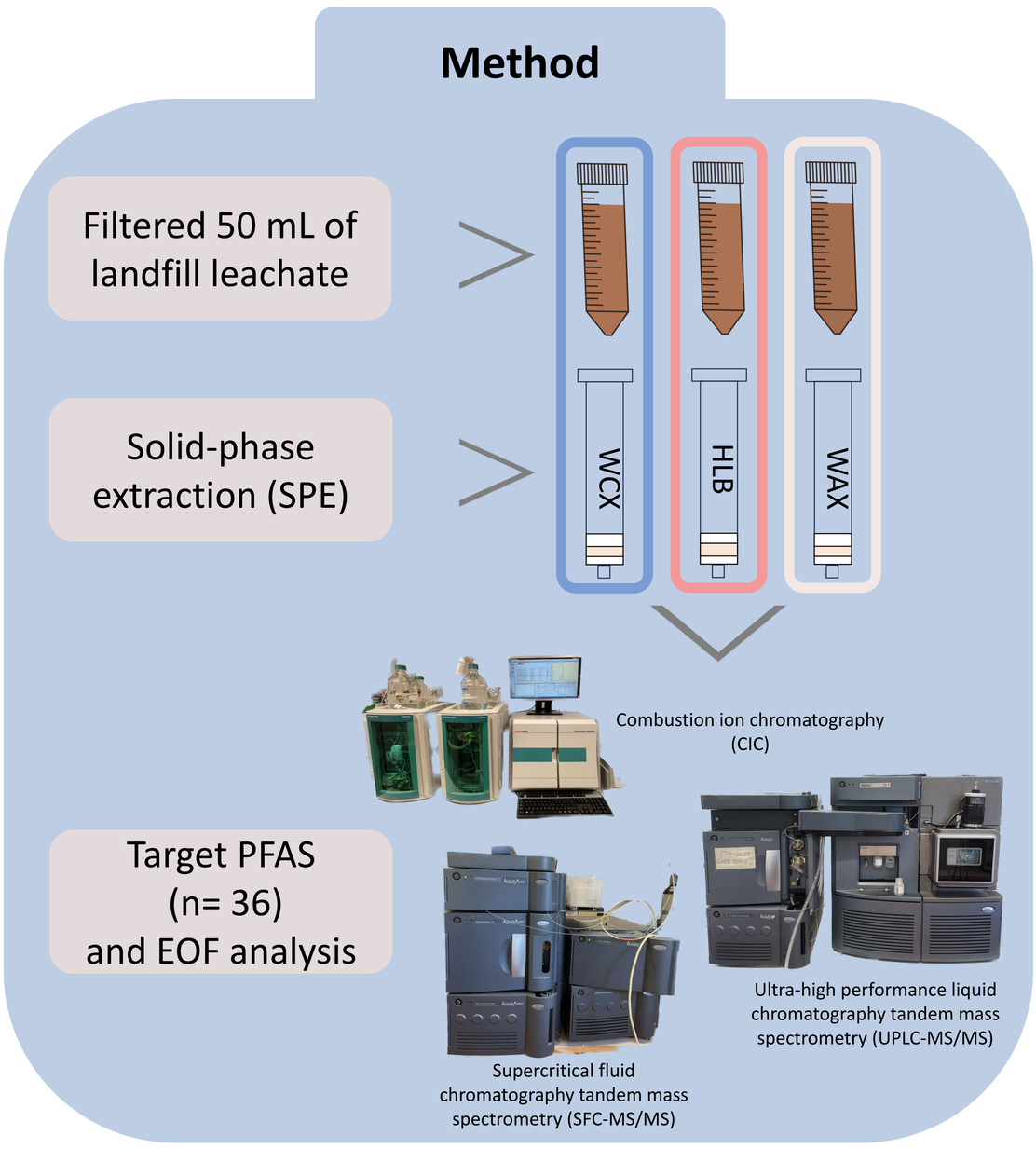
Introduction

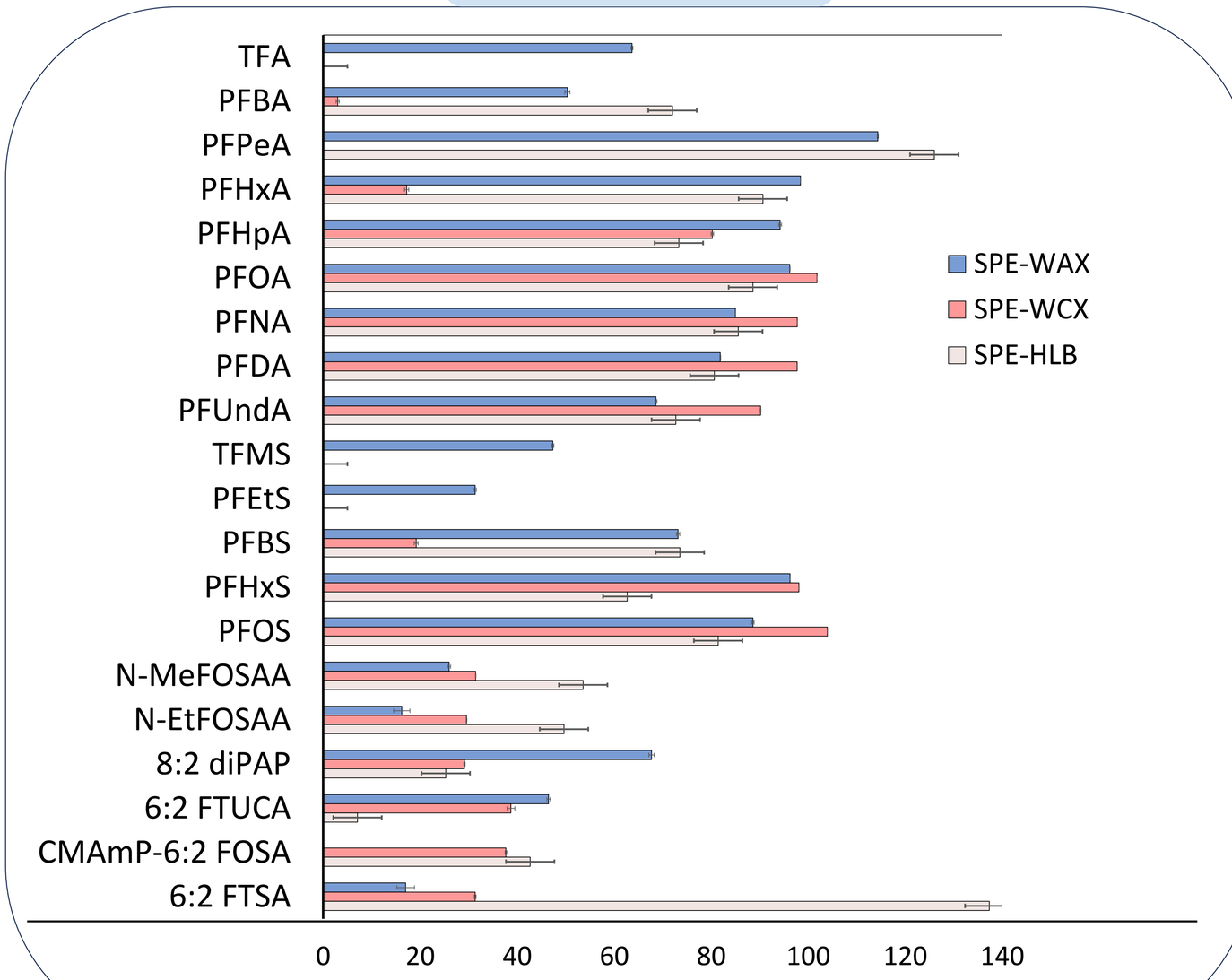
Although the reuse, reduction and recycling have become the fundamental way of waste handling globally, landfilling is still ongoing[1]. Many studies have shown the occurrence of PFAS in landfill leachate from different countries, indicating that regular treatments on site are ineffective in removing PFAS in leachate[2,3]. However, the reported results included a limited number of target PFAS, and the total load of PFAS in leachate is scarce.

- The objective of this work was to optimize an extraction method to assess the total PFAS in Swedish landfill leachate using target and extractable organofluorine (EOF) analysis.

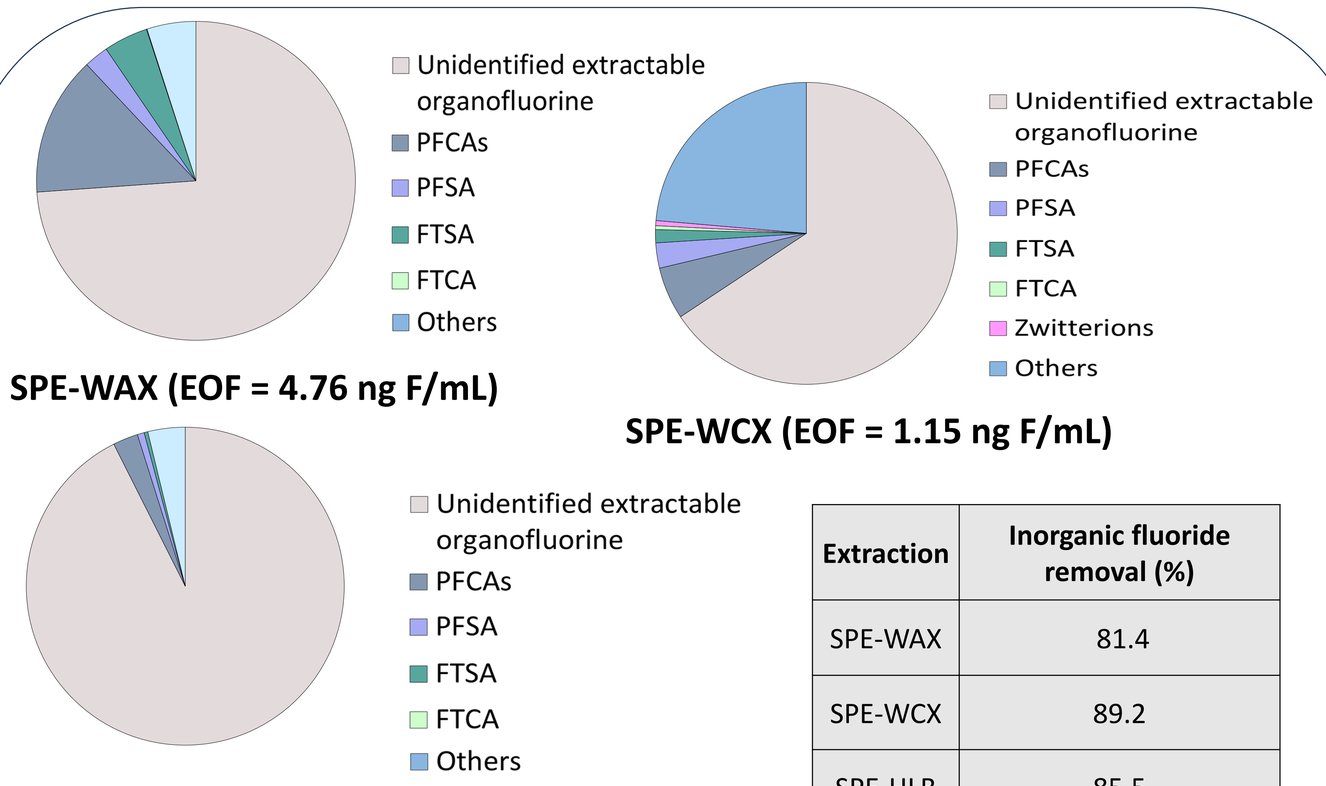
Method



Results



Recovery (%) of 20 PFAS spiked to landfill leachate samples.



Extraction	Inorganic fluoride removal (%)
SPE-WAX	81.4
SPE-WCX	89.2
SPE-HLB	85.5

Fluorine mass balance of landfill leachate determined by target analysis and EOF, and the removal of inorganic fluoride in leachate samples spiked with NaF.

Conclusion

- The recoveries of PFAS were within the acceptable range (50 to 120%) for WAX with exception of N-EtFOSAA and 6:2 FTSA. WCX exhibited unsatisfactory retention (< 20%) for ultra-short chain and short-chain PFCA and PFSA. The recoveries of 6:2 FTUCA, the ultra-short chain PFCA and PFSA were below 20% for HLB, and the recovery of 6:2 FTSA > 120%.
- The measured EOF was highest for HLB, followed by WAX and then WCX.
- For organofluorine mass balance analysis, the results showed that 35% of the fluorine mass balance was accounted for by target analysis.

This study indicates that one sorbent material cannot capture all studied PFAS, and the organofluorine content differs depending on the method used which makes comparisons difficult.

References
1. Ferronato, & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. International Journal of Environmental Research and Public Health, 16(6), 1060–.
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3. Lang, Allred, B. M., Field, J. A., Levis, J. W., & Barlaz, M. A. (2017). National Estimate of Per- and Polyfluoroalkyl Substance (PFAS) Release to U.S. Municipal L

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