

IV. 英文Abstract

Fate of Persistent Organic Pollutants and Candidate POPs Leaching from Landfills

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Analytical methods for PCNs, PFOA, PFOS, PFHxS, HCBd, HBCD, and dicofol applicable to landfill leachate was developed. Concentrations of these chemicals in 19 leachate samples from waste landfills in Japan were determined based on the analytical methods. PCNs, PFOA, PFOS, and PFHxS were detected in most of the samples, and their concentrations in leachate from industrial waste landfills tended to be higher than those from municipal solid waste landfills. In leachate treatment facilities, the removal rates of PCNs were high in a coagulation sedimentation and an activated carbon adsorption, while those of PFOA, PFOS, and PFHxS were high only in the activated carbon adsorption. The range of total PCNs content in the incineration residues from 34 types of incinerators at 22 facilities in Japan ranged from 48 to 1,800,000 pg/g. Although, no clear trend was observed by a furnace type or a sampling year. It was confirmed that the thermal dechlorination process, which has been adopted as a dioxin countermeasure, is effective in reducing the risk of PCNs. The effective diffusion coefficient in incineration fly ash was estimated to be from 2.3×10^{-13} to the maximum of 2.9×10^{-13} m²/s by diffusion tube tests, suggesting that the behavior of PCNs in the waste bed is dominated by an advection rather than a diffusion. Column experiments indicated that the presence of humic acid enhanced the elution of PCNs with large number of chlorine. From the past studies, it was inferred that the emission behavior of PFASs and PCNs from landfills is greatly affected by their carbon chain length, chlorine number, and organic carbon content in the solid phase. PCNs adsorption tests showed that the distribution coefficients for various solid phases (kaolin, sand, and red clay) tended to increase as the chlorine number of PCNs increased. Moreover, the distribution coefficients increased with increasing organic carbon content, suggesting that an adsorption characteristics was similar to those of hydrophobic organic chemicals. The result from measured concentrations of controlled landfill leachate and simulation-based predictive analysis, it was indicated that there was a relatively broad range of sources for PFOA, and was possibly affected by some spot landfill wastes for PFBA and PFHxS. In addition, the simulation for predicting the concentration of

leachate from a covered landfill site for municipal solid wastes showed that the adsorption performance of the intermediate cover soil buried in landfills affects the future PCNs discharge.

[References]

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