Flame retardant emission from e-waste recycling operation in northern Vietnam:Environmental occurrence of emerging organophosphorus esters used as alternatives for PBDEs

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Abstract

Three oligomeric organophosphorus flame retardants (o-PFRs), eight monomeric PFRs (m-PFRs), tetrabromobisphenol A (TBBPA), and polybrominated diphenyl ethers (PBDEs) were identified and quantified in surface soils and river sediments around the e-waste recycling area in Bui Dau, northern Vietnam. Around the e-waste recycling workshops, 1,3-phenylene bis(diphenyl phosphate) (PBDPP), bisphenol A bis(diphenyl phosphate) (BPA-BDPP), triphenyl phosphate (TPHP), TBBPA, and PBDEs were dominantamong the investigated flame retardants (FRs). The respective concentrations of PBDPP, BPA-BDPP, TPHP, TBBPA and the total PBDEs were 6.6-14000 ng/g-dry, b2-1500 ng/g-dry, 11-3300 ng/g-dry, b5-2900 ng/g-dry, and 67-9200 ng/g-dry in surface soils, and 4.4-78 ng/g-dry, b2-20 ng/g-dry, 7.3-38 ng/g-dry, 6.0-44 ng/g-dry and 100-350 ng/g-dry in river sediments. Near the open burning site of e-waste, tris(methylphenyl) phosphate (TMPP), (2-ethylhexyl) diphenyl phosphate (EHDPP), TPHP, and the total PBDEs were abundantly with respective concentrations of b2-190 ng/g-dry, b2-69 ng/g-dry, b3-51 ng/g-dry and 1.7-67 ng/g-dry in surface soils. Open storage and burning of e-waste have been determined to be important factors contributing to the emissions of FRs. The environmental occurrence of emerging FRs, especially o-PFRs, indicates that the alternation of FRs addition in electronic

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震災廃棄物の輸送計画に関するモデル分析-１次仮置場の制約条件に着目した検討-

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要　　旨

2011年3月に発生した東日本大震災は、我が国に甚大な被害をもたらした。発生した震災廃棄物の処理は発災から4年を過ぎた今日まで行われ、重要な課題となっている。近い将来には都市圏でも大震災が発生すると予測されており、膨大な量の震災廃棄物の発生が懸念される。廃棄物の発生地点から仮置場への運搬は、住民の公衆衛生の確保のため迅速かつ効率的な対応が求められるため、震災廃棄物を集積させるスペース（仮置場）を確保できるかどうかを事前に把握する必要がある。そこで本研究では、首都直下型地震が起こった際に発生する東京都23区内の震災廃棄物を対象に、線形計画法に基づいた輸送計画モデルを提案し、仮置場の受入可能量に関する制約条件の有無に着目した多角的な輸送計画を検討した。

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東京都における大気中揮発性有機化合物の組成と OH ラジカルとの反応による消失を考慮した CMB 解析

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Composition of VOCs and Source Apportionment by CMB Considering Photochemical Reaction Losses with OH Radical in Tokyo

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Abstract

The concentrations of more than 100 VOC species have been measured at three sites in Tokyo to estimate the source apportionment considering chemical loss during the summer high ozone concentration period. The photochemical initial concentrations (PICs), the levels of VOCs from sources before undergoing chemical reactions, have been calculated from the reactivity of the VOCs with OH radicals and the ethylene/1,3-butadiene ratio. When the ethylene/1,3-butadiene ratio is set to 17, the PICs are 1.4 times higher than the observed concentrations indicating a 30% chemical loss of emitted VOCs in the summer daytime. The PIC values depend on the value of the ethylene/1,3-butadiene ratio. Isoprene is the most affected because of its high reactivity. The CMB analysis using PICs have yielded better results, when comparing to the VOCs emission inventories. Diesel vehicle exhaust is the greatest source in the center of Tokyo while the biogenic source of isoprene is the highest in the site close to a mountain area. Gasoline vehicle exhaust, gasoline vapor (refueling loss and diurnal breathing loss), and coating are also important sources. Ethylene, formaldehyde, aromatics and other alkenes provide high contributions as a single substance.

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生物起源VOCを添加した東京の都市大気への光照射によるオゾンとホルムアルデヒドの生成

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Ozone and Formaldehyde Formation by UV Irradiation to Biogenic VOC Added Urban Air in Tokyo

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Abstract

The high ozone concentration in urban atmospheres including Tokyo is still one of the important environmental issues. One of the possible causes is ozone formation by unconsidered VOC. In this study, we performed chamber experiments to understand the importance of biogenic VOCs emitted from urban green flora. Isoprene and α-pinene were added to ambient air and irradiated by UV. The ozone and formaldehyde concentrations were measured to compare the ozone formation potential with the control. The ozone formation potential of isoprene was also compared to that of toluene. Considering the typical emission rates of isoprene and α-pinene, 10 and 0.7 ppbv of these VOCs were separately added to the ambient air in the chamber. Both isoprene and α-pinene showed approximately 30% higher ozone concentrations compared to the control after 6 h of UV irradiation. On the other hand, isoprene showed a 33% higher ozone concentration than toluene for a 10 ppbv addition to the ambient air after 6 h of reaction. This means that the ozone formation by biogenic VOC is important as well as that of anthropogenic VOCs, such as toluene, which is a typical anthropogenic VOC. The possibility that biogenic VOCs emitted from green areas and street trees are important for ozone formation has been suggested by this study.

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Toxic Identification and Evaluation of Androgen Receptor Antagonistic Activities in Acid-Treated Liver Extracts of High-Trophic Level Wild Animals from Japan

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Abstract

Sulfuric acid-treated liver extracts of representative high-trophic level Japanese animals were analyzed by toxic identification and evaluation (TIE) with chemically activated luciferase expression (CALUX) and chemical analysis to elucidate androgen receptor (AR) antagonistic activities and potential contributions of organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs). The activities were detected in striped dolphins (n = 5), Stejneger's beaked whales (n = 6), golden eagle (n = 1), and Steller's sea eagle (n = 1) with CALUX-flutamide equivalents (FluEQs) as follow: 38 (20-52), 47 (21-96), 5.0, and 80 μg FluEQ/g-lipid, respectively. The AR antagonism was detected in limited number of specimens at lower levels for finless porpoise, raccoon dog, and common cormorant. Theoretical activities (Theo-FluEQs) were calculated using the concentration of OCPs and PCBs and their IC25-based relative potency (REP) values. These total contribution to CALUX-FluEQ was 126%, 84%, 53%, 55%, and 44% for striped dolphin, Steller's sea eagle, Stejneger's beaked whale, finless porpoise, and golden eagle, respectively, and the main contributor was p,p′-DDE. However, most of the activities for raccoon dog (7.6%) and common cormorant (17%) could not be explained by OCPs and PCBs. This suggests other unknown compounds could function as AR antagonists in these terrestrial species.

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Occurrence of emerging flame retardants from e-waste recycling activities in the northern part of Vietnam

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Abstract

This study investigated the contamination status of 21 emerging flame retardants (FRs) in soils (n . 32) and river sediments (n . 8) from an e-waste recycling (EWR) site in the northern part of Vietnam. Among analyzed FRs, higher levels of decabromodiphenyl ethane (DBDPE) (NDe4200 ng/g dw), 1,2-bis-(2,4,6-tribromophenoxy)ethane (BTBPE) (NDe350 ng/g dw) and Dechlorane Plus isomers (DPs) (NDe65 ng/g dw) were

found in soils near EWR workshops and open burning places. The highest concentrations of DBDPE (20 ng/g dw), BTBPE (5.7 ng/g dw) and DPs (6.7 ng/g dw) were also detected in sediments collected from the middle of the EWR site. The levels decreased concomitantly with increasing distance from the EWR site. These results indicate that these FRs were released to the surrounding environment from improper recycling activities, such as manual dismantling of devices and open burning of e-wastes.
Moreover, the estimated daily intakes of those FRs via soil ingestion were approximately ten times higher for children than adults. To our knowledge, this is a first comprehensive study on characterization of soil and sediment contamination by a series of emerging FRs at an EWR site in Vietnam.

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森林の樹冠構造がヒートアイランド現象緩和機能に及ぼす影響

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要　　旨

ヒートアイランド現象の緩和対策として，都市緑地による熱環境緩和効果が期待されている。これまでの緑化対策では樹高しか着目されておらず，樹冠構造については考慮されなかった。樹冠構造の異なる緑地を対象に，樹冠構造の発達が地表面温度に影響するか検討した。その結果，樹冠の厚みが増すと日中の表面温度を下げ，夜間の表面温度を下げないことがわかり，昼夜間の温度変化を緩和する効果があった。そのため，樹冠構造を発達することが，都市林におけるヒートアイランド現象緩和機能を強化することがわかった。

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関東地方の夏季高濃度Oxの長期的濃度変動要因の検討と前駆物質濃度削減効果の予測評価

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Variable Factors Affecting Long-term Trend in Summertime High Ox Concentration and the Reduction Effect of the Precursors' Concentrations in Kanto Region

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Abstract

The relationship between NMHC, NOx concentrations and Ox formation has been analyzed using the data observed during 1990-2011 in the Kanto region. The relationship seemed to be clearer by removing the effect of the meteorological conditions. It showed that the status of the Kanto region has been VOC-sensitive. The relationships between the precursor concentrations and Ox formation have varied according to the three periods showing the possibility that the change in the Ox measurement methods had been affected. The change in the VOC composition produced very little change in the reactivity although aromatic compounds had significantly decreased. According to the estimation using the occurrence ratios of high Ox concentration days, a 20% reduction of the NMHC concentration based on 2009-2011 average may cut in half the number of high Ox concentration days even if the NOx concentration decrease by 20%. The NMHC concentration should be reduced by 50% in order to reduce the number of high Ox concentration days to a zero level.

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