NOVEL HALOGENATED HYDROCARBONS IN ENVIRONMENTAL SAMPLES AND ASSOCIATED HUMAN EXPOSURES IN E-WASTE RECYCLING FACILITIES IN CHINA

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ABSTRACT

Environmental pollution arising from e-waste disposal and recycling has received considerable attention in recent years. Treatment, at low temperatures, of e-waste, that contain polyvinylchloride and related polymers can release significant amounts of persistent halogenated hydrocarbons (PHHs), such as polybrominated diphenyl ethers (PBDEs), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs), polybrominated dibenzo-p-dioxins and dibenzofurans (PBDD/Fs), chlorinated polycyclic aromatic hydrocarbons (ClPAHs) and precursor polycyclic aromatic hydrocarbons (PAHs). In this study, electronic shredder waste, workshop-floor dust, leaves, surface soil, and human hair samples of e-waste recycling workers, collected from a large scale e-waste recycling facility in Taizhou, eastern China, were analyzed for PHHs. The highest mean concentration of PBDEs was found in electronic shredder waste (45500 ng/g dw). The mean concentrations of total PCDD/Fs and PBDD/Fs were the highest in workshop-floor dust (39800 pg/g dw for PCDD/Fs, and 116000 pg/g dw for PBDD/Fs). Significant correlations were found between ∑PBDD/Fs and ∑PBDEs, and between ∑PBDD/Fs and ∑PCDD/Fs. The TEQ values of PBDD/Fs were higher than those of PCDD/Fs in most samples. PBDD/Fs are emerging contaminants from operations related to disposal and treatment of plastics and wastes containing flame retardants. We also report for the first time, ClPAHs in samples collected from e-waste recycling facility and correlations between ΣClPAH and ΣPAH concentrations. ClPAHs are significant dioxin-like contaminants and are ubiquitous in the environment. The contribution of ClPAHs to dioxin-like toxicity in the e-waste facility exceeds the contribution of PCDD/Fs in the same samples. The low-tech e-waste recycling operation is a major emission source of PBDEs, ClPAHs, chlorinated and brominated dioxins and furans.

Keywords: E-waste, PBDEs, PCDD/Fs, PBDD/Fs, ClPAHs, PAHs, Human exposure