SOURCES OF CO-PCBS IN SEDIMENTS OF HAN RIVER IN THE SOUTH KOREA

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Abstract

Sediment from upstream and downstream of Hanriver which is representative river in Korea were analyzed for Coplanar PCBs(Co-PCBs) using HRGC/HRMS. Total concentrations of Co-PCBs in upstream were detected 48.32 ~ 283.87 pg/g-dry lower than 19.18 ~ 4918.15 pg/g-dry in downstream. Sites observed high concentrations of total Co-PCBs are related with tributary entering to Hanriver. Especially, site of the highest concentration may be affected by tributary and wastewater treatment plant of landfill leachate (WWTP). As a result of a comparison of congener profiles between source and sample shows that commercial PCBs products maybe play an important role as a source of Co-PCBs in sediment of Hanriver. This study is one of the steps to manage the PCBs in Hanriver.

Introduction

Some non- and mono-*ortho*- polychlorinated biphenyls (Co-PCBs) are thermally stable, high lipophilic compounds like a PCDD/DFs that diffused the environment media, including air, water, soil, sediment, animals and human. Co-PCBs are eventually transferred to the aquatic environment, where they are accumulated in aquatic organisms. Due to their inherent chemical and physical properties, concern of the bioaccumulation of these compounds in aquatic biota is increasing. Contaminated sediments by POPs such as PCBs, PCDD/DFs are a persistent source to other media(water, submarine organisms and so on)[1)]. So, sediment is very important media to study and manage environment. Objectives of this study are an analysis and source estimation of Co-PCBs in sediment in upstream and downstream of Hanriver, Korea.

Materials and Methods

Sampling

Surface sediment sample was collected at 18 sites with 3 point per 1 site such as fig. 1. Sites were distributed by upstream (Bukhan-river; S1 ~ S4 sites and Namhan-river; S5 ~ S9 sites) and downstream (Han-river; S10 ~ S18 sites).

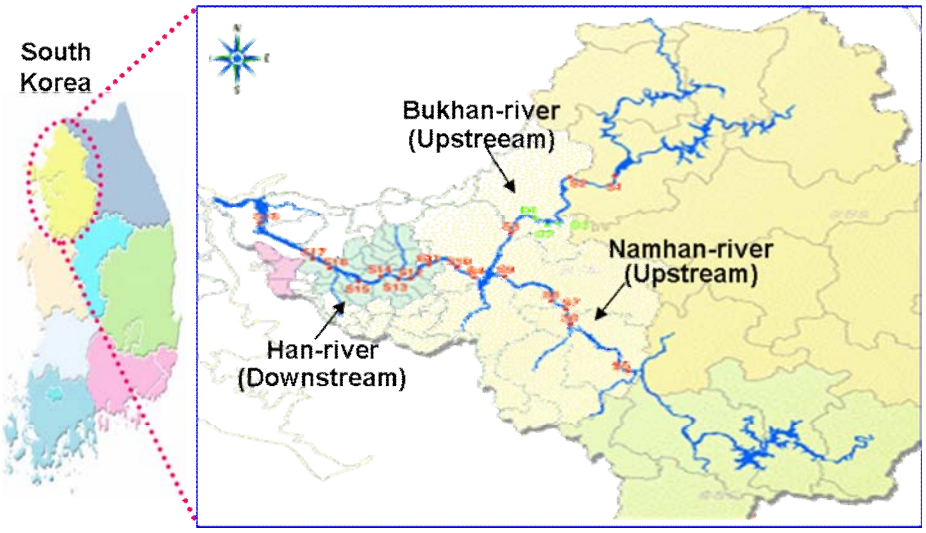

Figure 1. Sampling sites of sediment in Hanriver

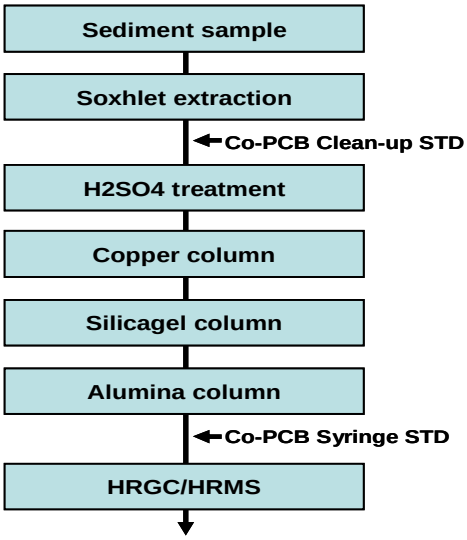

Figure 2. Flow chart of analyze procedures

Procedure of analysis

Co-PCBs in the surface sediment were analyzed as EPA Method 1668. The ^{13}C-Labelled STD EC4977 (Cambridge Isotope Laboratories) and EC-4979 (Cambridge Isotope Laboratories) were used as the internal and recovery standards, respectively. The cleanup procedure was as follow; treatment of the concentrated sulfuric acid, multi-layer silica gel column and alumina column (Fig. 2). Finally all samples were analyzed by HRGC/HRMS (HP6890N/Thermo Finnigan MAT-95XP) using the DB-5MS capillary column (60m×0.32mm×0.25um).

Results and Discussion

Concentration of Co-PCBs

Co-PCBs levels in surface sediment of Bukhan-river, Namhan-river and Han-river individually ranged 49.38 ~ 137.22 pg/g-dry, 48.32 ~ 283.87 pg/g-dry, 19.18 ~ 4918.15 pg/g-dry. The downstream (Han-river) concentrations were relatively higher than upstream(Fig.3). The highest level (4530.67 pg/g-dry) was observed in S16 which is entering a tributary and which is near the wastewater treatment plant of landfill leachate. Other high concentrations were detected from

S14 (Zung-rang stream), S11(Wong-suk stream), S13(Tan stream) in order. We can observe that the sites of High concentrations may be related to input of an effluent of WWTP.

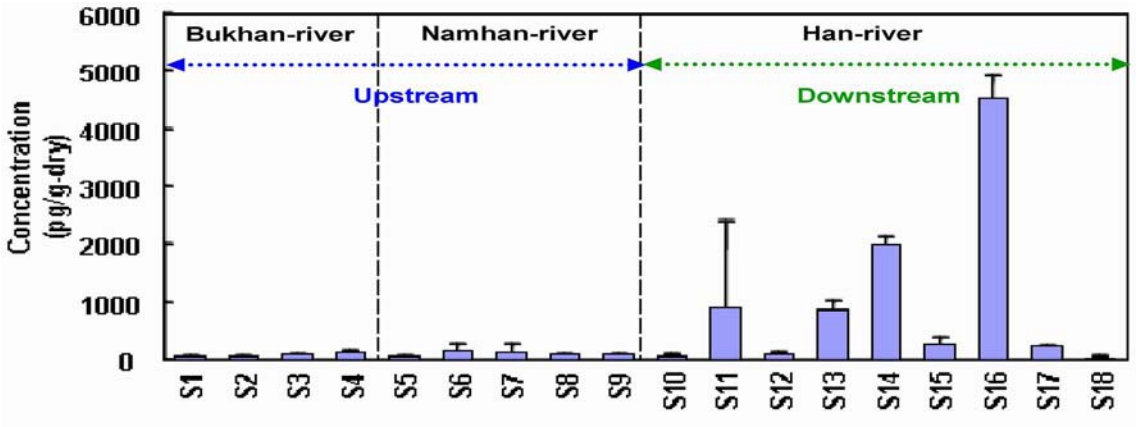

Figure 3. Concentration of Co-PCBs in surface sediment of Upstream and Downstream

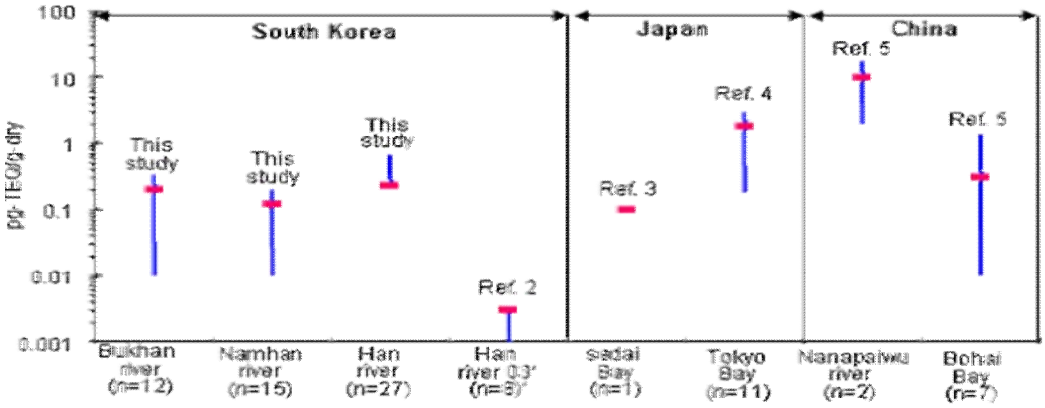

Figure 4. Comparison of TEQ concentration between this study and other countries

TEQ values in this study are higher than previous study (2003) for Hanriver sediment and lower than Tokyo Bay and Nanapiwu river sediment (Fig. 4). TEQ levels in this study are not significant level in comparison with neighboring country in Asia.

Profile of Co-PCBs congeners

Fig. 5 reveals that the major congeners of Co-PCBs in sediment are PCB-118, 105, 156, and 77. These congeners are the major components of the commercial PCB products such as an Aroclor, Kanechlor[5,6]. Therefore, this result represent that the sediment might have been influenced by the commercial PCB product in this study.

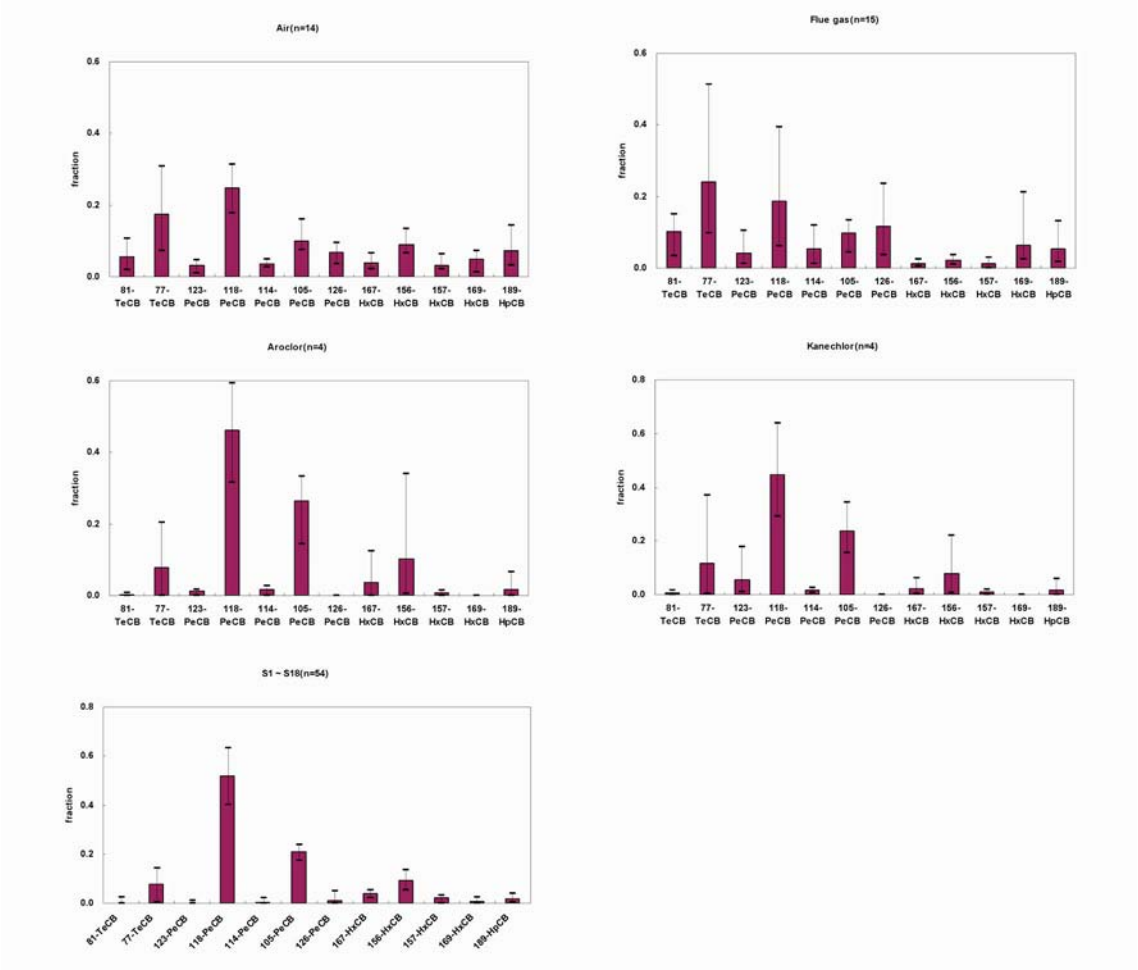

Figure 5. Comparison of congener profile between PCBs source and sediment of this study

Acknowledgements

This study was supported by National Institute of Environmental Research.

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