

Application form for the International Session in the 18th Symposium on Environmental Chemistry

Title of presentation : International Pellet Watch: Global monitoring of POPs using beached plastic resin pellets

Authors (first, middle, and last names; affiliation should be in parentheses; presenter should be underlined)
Yuko Ogata, Hideshige Takada, Satoru Iwasa (Laboratory of Organic Geochemistry, Tokyo University of Agriculture and Technology), Rei Yamashita (Graduate school of Fisheries Sciences, Hokkaido University)

Resident country : Japan

E-mail address of corresponding author: shige@cc.tuat.ac.jp

Select one of the following conditions for the financial support: 3

1. I need financial support and if the financial support will not be given I will not attend the session.
2. I like to receive financial support. However, unless the financial support will be given, I will attend the session.
3. I do not need financial support.

The persons who like to receive the financial supports (i.e. conditions 1 or 2) should send the abstract. The form of the abstract will be found in the next page of this application form. The abstract should be within 1 page including title and the authors. The authors can put figures and/or tables in the abstract of 1 page. Because the abstract will be sent to the committee via e-mail, the size of the file should be less than 5 M. We do not set any format as long as the abstract contains title and the authors and understandable. Converting the file to pdf format and sending the pdf file is encouraged. The abstract together with the application form as one pdf or word file should be sent to the committee (jecint09@cc.tuat.ac.jp) by the end of February 2009.

Title : International Pellet Watch: Global monitoring of POPs using beached plastic resin pellets

Authors : Yuko Ogata, Hideshige Takada, Satoru Iwasa (Laboratory of Organic Geochemistry, Tokyo University of Agriculture and Technology), Rei Yamashita (Graduate school of Fisheries Sciences, Hokkaido University)

Introduction : Plastic resin pellets are small granules, generally with shape of a cylinder or a disk with a diameter of a few mm. These plastic particles are the industrial raw material of plastics which are transported to manufacturing sites where “user plastics” are made by re-melting the pellets and molding them into the final products. Resin pellets can be unintentionally released to the environment, both during manufacturing and transport. The released resin pellets are carried by surface run-off, streams and river waters, eventually leading to the ocean. Because of their environmental persistence, they are distributed widely in the ocean and are now found on beaches all over the world. Because of the hydrophobic nature of the plastic surfaces, hydrophobic pollutants such as PCBs and DDTs are adsorbed to the pellets from the surrounding seawater with concentration factors of up to 10^6 . Because the resin pellets are distributed on beaches over the world, and because collection and shipping of the pellets are easy, we proposed global monitoring of persistent organic pollutants (POPs) using these beached plastic resin pellets, that is “International Pellet Watch” (Takada, 2006). In this paper, the latest results of our monitoring is presented.

Materials and Methods : Beached plastic resin pellets from 32 locations of USA, UK, Netherland, Italy, Greece, Portugal, Japan, China, Vietnam, Thailand, Malaysia, Singapore, Indonesia, India, Turkey, Australia, Mozambique, South Africa were analyzed for PCBs, DDTs and HCHs. The pellets were sorted by far-infrared spectrometer and color difference meter to select yellowing polyethylene (PE) pellets which were proven to accumulate higher concentrations of PCBs (Endo et al., 2005). To consider piece-to-piece variation, 5 pools (one pool consist of 5 pieces of pellets) were analyzed for each location and the median concentrations were used to represent individual locations. Pellets were extracted with hexane by maceration. The extracts were purified by silica gel column chromatography. PCBs and DDE were measured by gas chromatograph equipped with ion-trap mass spectrometer (GC-MS). DDT, DDD, and HCHs were gas chromatograph equipped with electron capture detector (GC-ECD)

Results and Discussion : PCB concentrations in the polyethylene pellets were highest on US coasts (100 - 500 ng/g), followed by western European countries (e.g., U.K. and Netherlands) and Japan (50 - 100 ng/g), whereas lower in tropical Asia, southern Africa and Australia (5 - 50 ng/g), as shown in Fig.1. The spatial pattern was well correlated with that of the monitoring results of mussel watch (Fig.2), indicating that concentrations of hydrophobic contaminants in the plastic pellets reflect the pollution status of the coastal environments. DDTs showed high concentrations on the west coast of USA (~300 ng/g) and Vietnam (~200 ng/g). In Vietnam, DDT was predominant over its metabolites (DDE and DDD), suggesting current usage of the pesticide. High concentrations of HCHs were detected in the pellets from southern Africa (~30 ng/g), whereas HCHs showed trace concentrations in the other areas in the world (~ 1 ng/g or lower). This suggests current usage of the pesticide in southern Africa.

The present paper demonstrated the utility of International pellet watch. However, our spatial coverage is still very limited and of course the strength of the programme will be related to the coverage we can achieve. Please collect resin pellets on your nearby beaches and send them to us. We call for pellets.



Figure 1. Concentration of PCBs* in beached plastic resin pellet (ng/g-pellet)

*sum of concentrations of CB#66, 101, 110, 149, 118, 105, 153, 138, 128, 187, 180, 170, 206

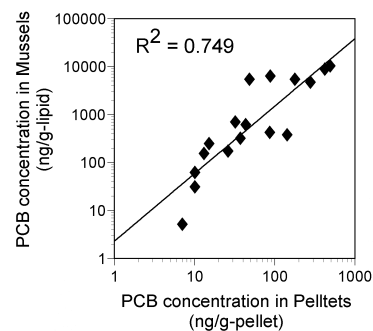


Figure 2. Correlation in PCB concentrations between beached plastic pellets and Mussel. Data on Mussel after Yamaguchi et al. 2000, Monirith et al. 2003, NOAA 2007

References :

- Endo, S. et al. (2005) *Mar. Pollut. Bull.*, 50, 1103-1114.
- Monirith et al. (2003) *Mar. Pollut. Bull.*, 46, 281-300.
- NOAA (2007) http://www8.nos.noaa.gov/cit/nsandt/download/mw_monitoring.aspx
- Takada, H. (2006) *Mar. Pollut. Bull.*, 52, 1547-1548.
- Yamaguchi et al. (2000) *Chiku-kagaku*, 34, 41-57.