Contamination of Perfluorooctane Sulfonated (PFOS) and Perfluorooctanoic Acid (PFOA) in Air

Jirarat Pattanasuttichonlakul, Narin Boontanon, and Suwanna Kitpati Boontanon

Abstract—PFOS and PFOA are widely used in industrial and commercial products. There are consisting of (C-F bonds) with a sulfonated group and carboxylic group, which make its persistent, bioaccumulative and toxic. PFOS and PFOA are introduced into the environment by several processes such as wastewater, leaching from consumer products or dust during production process. The analytical procedure for determination in ambient air which collected monthly during 2010-2012 in 4 provinces, Thailand, were performed using ASE, SPE and HPLC-MS/MS. The results show that concentration of PFOS was higher than PFOA ranging between 0.44-6.75 ng/g and 0.23-0.46 ng/g, respectively. Trends of distribution were found dominantly in TSP particles of PFOS 0.74-6.75 ng/g and PFOA 0.20-0.35 ng/g, while PM10 was found lower in ranges 0.41-0.51 ng/g and 0.06-0.34 ng/g, respectively. Contamination of PFOS and PFOA in ambient air could be a potential source of human exposure which may cause human health risk for who lives nearby the source.

Keywords—PFOS, PFOA, dust, airborne

I. INTRODUCTION

RECENTLY, environmental problem issue have been increasing considered due to the adaptation of technologies, rapidly increasing of population or higher requirement of products (various products from manufacturing process were served these requirements). Many industries are used perfluorooctane sulfonated (PFOS) and perfluorooctanoic acid (PFOA) in production processes such as soil, stain, grease resistance to carpets, textiles or leather and chemical resistant for tubing, coating on cookware including food containers. It is also a surfactant for cleaning the products and performance of products. PFOS and PFOA contamination in ambient air are also very important for human health risk because there is a possibility that PFOS and PFOA can absorb on dust then exposure into human body via dust ingestion. Although, these compounds have been detected frequently, but there is still no standard and control of use, thus it is quite interesting to study.

This research aims to study the concentrations of PFOS and PFOA in airborne dust as total suspended particulate matter (TSP) and particulates smaller than 10 microns (PM10) and its distribution in the atmosphere in terms of particle sizes and seasonal variation and calculated human health risk assessment.

II. MATERIALS AND METHODS

A. Samples and sampling sites

The 290 samples of total suspended particulate matter (TSP) and particulates smaller than 10 microns (PM10) which collected from 9 stations located in 4 provinces were shown in Fig. 1 including Saraburi (2 Stations), Nontaburi (1 Stations), Bangkok (3 Stations), and Samutprakarn (3 Stations) were collected from Pollution Control Department (PCD) and Ministry of Natural Resources and Environment of Thailand envi 7. The samples were conducted monthly during 2010-2012. Each sample, approximately 1,600 m³ of air, were collected over a period 24 hours with High volume air sample. Air dust samples as TSP particles were collected on a glass fiber filter (PALLFLEX 2500QAT-UP, pattern as 8x10 in., Pallflex Products Corporation, USA) and PM10 particles were collected on a quartz membrane filter (Whatman, pattern as 8x10 in., Whatman International Ltd., England). All filter samples were kept in Ziploc and stored at room temperature until analyzed.