

CONCENTRATION OF PERFLUORINATED COMPOUNDS (PFCS) IN ENVIRONMENT, THAILAND

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Introduction: The perfluorinated compounds (PFCs) are a group of synthetic chemicals which are fluorine containing chemical and resistant to breakdown¹. There are many forms of PFCs but the two most commonly found containments are perfluorooctanesulfonate (PFOS) and perfluorooctanoic acid (PFOA). PFCs have been released in large quantities from manufacturing facilities for decades, and thus contaminate our food and some water supplies. PFOS and PFOA are breakdown products of a number of PFCs and it are harmful to human health and environment². They are bioaccumulative in wildlife and humans³⁻⁶, and are persistent in the environment. They are toxic to laboratory animals⁷ and wildlife, producing reproductive, developmental, and systemic effects in laboratory tests. The objectives of the project were to assess the status of perfluorinated compounds (PFCs) residue in environmental samples and support data to Stockholm's committee and Stockholm's secretarial of Thailand.

Materials and Methods:

Sampling locations were chosen due to the importance of the areas and their activities such as industrial estate area, domestic area and rural area during 2016-2018. The water samples, sediment samples, Seabass fish samples and ground water samples were collected from twelve stations in wet season and dry season. The twelve stations were four main rivers (The Chao Phraya River, the Mae Klong River, the Tha Chin River, and the Bang Pakong River) and the industrial estate area such as Rayong province and Samutprakarn province. All samples were extracted with SPE method through sorbent per WAX cartridge and qualification with Liquid Chromatograph–Tandem Mass Spectrometer (LC-MS/MS). Target Compounds: PFOS, PFOA, PFBA, PFHxA, PFHxS, PFNA, PFDA, PFUnA, PFDoA.

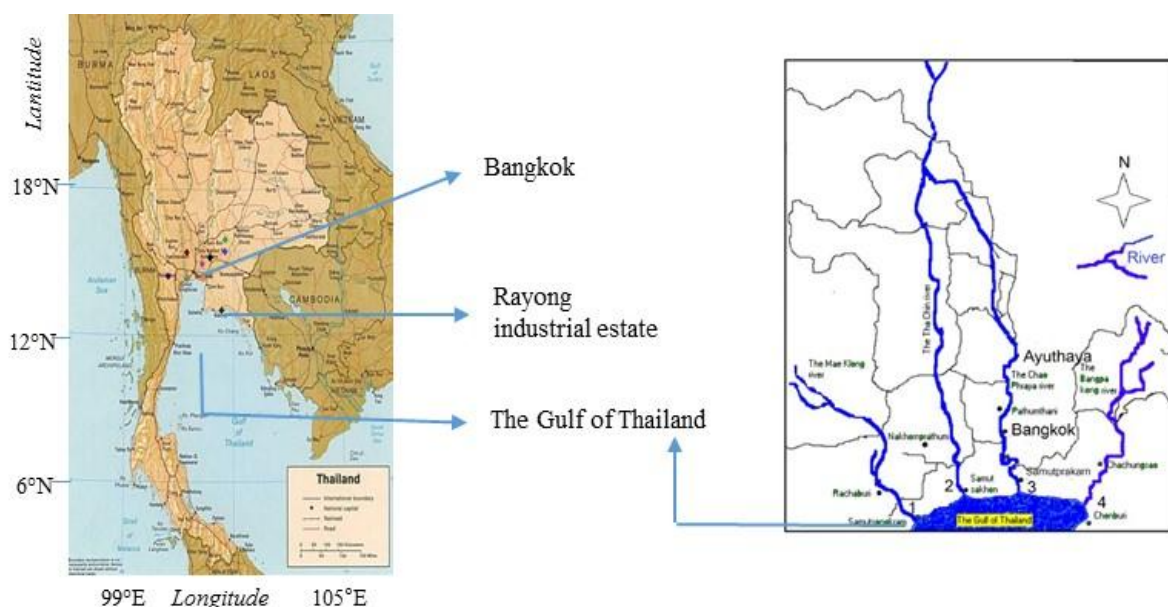


Fig1. Sampling locations and 4 main rivers
(1: Thachin river, 2: Mae-klong river, 3: Chao Phraya river, 4: Bang-pakong river)

Results:

The results showed that PFCs concentrations in water, sediment, fish, and ground water samples were detected at very low concentration, except the station at near industrial estate area. Samutprakarn province is southern part of Bangkok and near river mouth, it has two industrial estate, namely Bangpoo and Bangpee. In this study, Samutprakarn province detected various kinds of PFCs with slightly higher concentrations than the other stations

such as PFHxA concentration range at 9.4 – 14 ng/L, PFOA concentration range at 12-14 ng/L, PFDA concentration range at 1.6-2.0 ng/L during the year 2016-2018 (Fig1). In the year 2018 high concentration of total PFCs were found in samples collected at Rayong province, such as water samples 1,113 ng/L (PFHxS) in dry season were detected (Fig2). The concentration level in ground water samples were 0.05-340 ng/L and the highest concentrations were found in samples collected at Rayong industrial estate (0.39-340 ng/L). The concentrations of total PFCs in sediment samples at Rayong province (23 ng/g), and the concentration level in Seabass fish samples were 0.12 – 0.94 ng/g and the highest concentration detected 0.94 ng/g (PFOS) which was found in sampes collected near Rayong industrial estate. Rayong industrial estate area mainly produce petroleum. The results of recovery in water, sediment, biota samples are 78-86%, 97-103%, 72-86%, respectively. The detection limit of our analysis was 0.03 ng/L in water samples and 0.02 ng/g in sediment and fish samples.

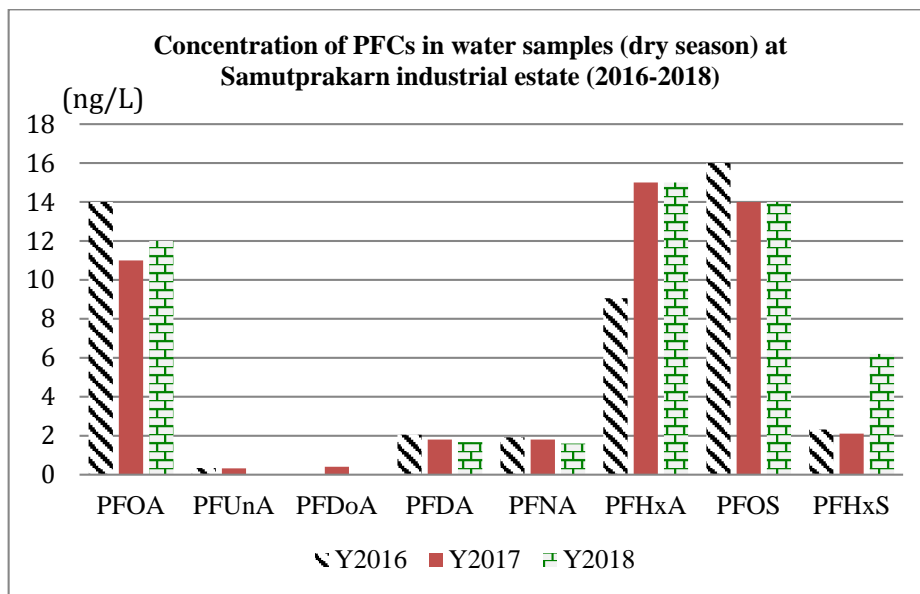


Fig 2. Comparison of PFCs level in water samples, dry season at Samutprakarn province (the year 2016-2018)

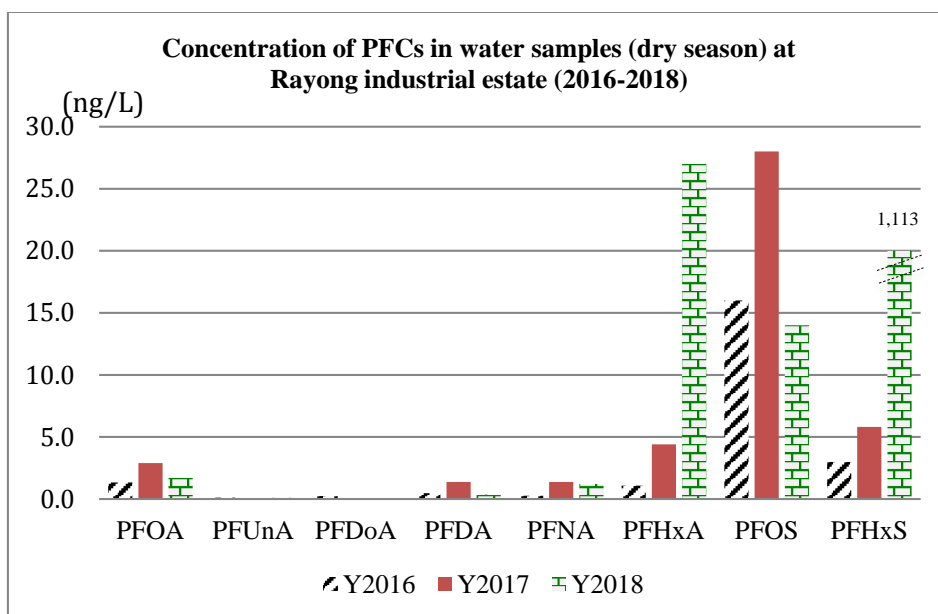


Fig 3. Comparison of PFCs level in water samples, dry season at Rayong province (the year 2016-2018)

Conclusions:

This study indicated that the PFCs were detected in environment of Thailand. The average concentrations showed very low level. The results of this study were submitted to Pollution Control Department as secretariat of Stockholm convention committee of Thailand. The monitoring database of new POPs (PFCs) in waters, sediments and biotas in coastal area is quite new for Thailand, especially for locations such as industrial area, and four river mouths of Thailand. The Department of Environmental Quality Promotion usually submit an annual report on the monitoring results under the UNU's network to Thai committee. In order to improve our monitoring database of new POPs, we need to improve our capacity for analysis of other new POPs in which the data obtained will be useful for pollution prevention and environmental protection in Thailand.

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