Study on Decomposition Conditions of Perfluorohexanoic Acid in Industrial Wastewater by UV Irradiation and Method of Fluorine Recovery

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1. BACKGROUND AND OBJECTIVES

PFCs are man-made chemicals not found in natural environments. The most common PFCs are PFOS and PFOA, which are widely used in industrial and consumer products. Since 2009, PFOS has been listed as a POP by the Stockholm Convention. Due to regulations on the use of PFOS and PFOA, concentrations of shorter chain PFCs such as PFHxA in water environments has been increasing. Industrial wastewater is considered a major source of PFCs contamination. Moreover, there are few studies regarding the occurrences of PFCs in developing countries. As such, there is an increasing need for treatment methods to remove PFHxA. Main objectives of this study are as follows: **1)** To investigate the occurrences of PFCs in industrial wastewater in Bangkok. **2)** To study on conditions of PFHxA by UV. **3)** To study the recovery of fluorine.

2. RESEARCH AND EXPERIMENT METHODS

(1) PFCs in 13WWTPs and applications of adsorbents to wastewater treatment; A study was conducted to examine the occurrence of PFCs in WWTPs in an industrial area in Bangkok. Batch method adsorptions experiments were conducted to study the adsorption capabilities of ion exchange resins on wastewater collected from the region.
(2) Decomposition conditions of PFHxA in *Milli-Q* water; Effects of lamp energy, initial concentration, temperature, and irradiation time on PFHxA UV decomposition were examined.
(3) Decomposition conditions of PFHxA in wastewater and fluorine recovery; PFHxA in wastewater obtained from a fluororesin processing plant was subjected to adsorption treatment. The resulting concentrated solution was subjected to UV light to examine its decomposition efficiencies and fluorine recovery rates.

3. RESULTS AND DISCUSSIONS

At WWTPs in Thailand, PFCs concentrations in effluent increased when compared to influent, rising concerns of PFCs pollution of the environment. Due to PFOA regulations, the ratio of PFOA in effluent fell while the ratio of shorter chained PFCs such as PFHxA and PFBS instead. PFHxA decomposed by 97.7% after 10 min. of irradiation and 66.6% of PFHxA defluorinated after 30 min. of irradiation. When using adsorption as a pretreatment, half-life of PFHxA was reduced from 13.0 min. to 7.6 min. and recovery ratio of fluorine was improved from 26.2% to 65.8%.

4. CONCLUSION

In recent years, the use of PFHxA has seen an increase and high concentrations of PFHxA were detected in WWTPs in Bangkok. Due to adsorption as a pretreatment, decomposition rate of PFHxA in WW and fluorine recovery improved compare to only UV treatment.

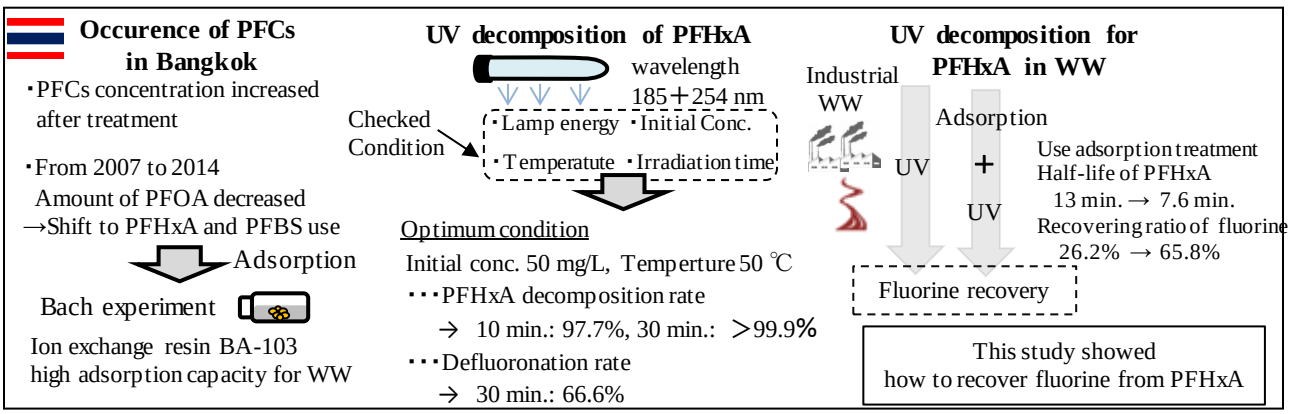

Figure1 Outline of this study