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464 - Behaviors of perfluoroalkyl acid precursors in sewage treatment plants

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Abstract Body: Per- and poly-fluoroalkyl substances (PFASs) have received wide attention due to their persistence and global distribution. They have been used for industrial and consumer applications due to their excellent properties such as chemical stability and water/oil repellency. Among them, perfluorooctanesulfonic acid (PFOS) and its salts perfluorooctane sulfonyl fluoride are now regulated under the Stockholm Convention on POPs. The production of perfluorooctane carboxylic acid (PFOA) is phasing out by its manufacturers. However, many PFAS precursors that may transform into PFOS and PFOA in the environment are still being produced. As the precursors are numerous, their occurrence in the environment is difficult to grasp by individual analyses. Recently, Houtz and Sedlak (ES&T, Vol. 46, p. 9342-9349, 2012) proposed a new method of detecting total PFAS precursors by their oxidative conversion into perfluoroalkyl acids (PFAAs). In this study we used their method to know the behavior and mass balance of PFASs in the three sewage treatment plants in Japan. The total concentration of Σ PFAAs (carboxylic, sulfonic and phosphoric acids), increased by 3.8 to 11 times in the influents after the oxidation treatment indicating that total concentration of PFAA precursors are much higher than the that of PFAAs. Among the PFAAs, C₇₋₁₀ alkyl carboxylic acids increased most by oxidation. While the concentrations of Σ PFCAAs did not change much during the secondary biological treatment, the concentration of Σ PFASs including precursors decreased by 70–80%. The removal of Σ PFASs as excess sludge, however, only accounted for 10–20% of the influent loads. This indicated that large removal of Σ PFASs occurred in aeration tanks, possibly by the evaporation of volatile PFAA precursors. The tertiary treatment by chlorination and ozonation did not remove Σ PFASs significantly.