

Q&A

11Q8: Recently, I heard discussions about PFOS and PFOA; organic fluorine compounds. Please tell me PFOS and PFOA. (Y.O, Japan)

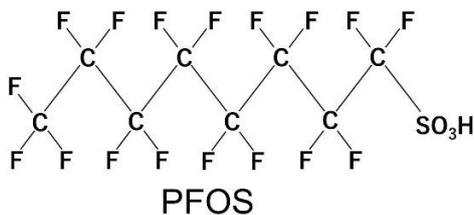
Ministry of the Environment, Japan published a surveillance report regarding PFOS and PFOA in rivers and ground water across the country on 11th July 2020. Some results exceeded temporary target value of the aqueous environment at 37 sites of the 171 sites surveyed. Those 37 sites were not the source of drinking water, but I have a question about PFOS and PFOA, as follows.

- What kind of material are PFOS and PFOA?
- What kind of use were PFOS and PFOA used by?
- The risk to health
- The regulation of PFOS and PFOA
- The current status of water quality standard for drinking water
- Method of removing PFOS and PFOA in water treatment process and analysis method

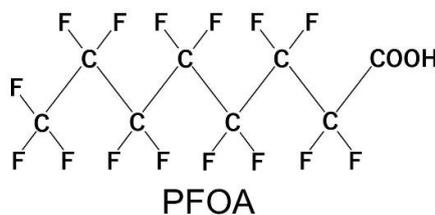
A: Outline, usage and risks

PFOS is perfluorooctane sulfonic acid and PFOA is perfluorooctanoic acid. Both are chemically synthesized organic fluorine compounds as shown below. They are not chemically degradable nor biodegradable. And they cannot be burnt by fire. PFOS was used as a surfactant for foam extinguisher, water repellent, etc. PFOA was used as a source material of producing Teflon or treating water repellent.

PFOS: perfluorooctane sulfonic acid



PFOA: perfluorooctanoic acid



Risk to human health of PFOS and PFOA is not evident by academic ways yet. But Stockholm Convention on Persistent Organic Pollutants has restricted their production and usage under some situations and the compounds are undegradable and can be accumulated in human body. Major chemical engineering companies have stopped their usage since 2015. In Japan, their usage have been stopped already though water environment, especially ground water pollution is still serious problem.

Legal regulation and water quality standard for drinking water

In Japan, production, import and usage of PFOS are very restricted by the act*¹ according to the decision of the Stockholm convention. Production and import are mostly inhibited. For usage, changing to alternative products are mostly completed. PFOA will be restricted by the same way as PFOS in 2020. Other 182 countries joined the convention are expected to be in the same condition. The ministry of the environment, Japan noticed that PFOS and PFOA is newly included to the list of monitoring parameters which are not standard yet. Its goal value is provisionally 50ng/L as total value of two compounds.

*1: Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc.

In Japan, "PFOS and PFOA" was added to the list "Complementary items of Water Quality Standard" in April 2020. Its target value is provisionally 50ng/L (0.00005mg/L) as the total concentration of PFOS and PFOA. Complementary items are not standard, which has to be ensured by water utilities, but expected to monitor by each water utility. Actually, all large scale water utilities and most of middle scale utilities are monitoring these items in Japan. By this adding, more information of PFOS and PFOA concentration in drinking water can be obtained.

In USA, health advisory levels by USEPA is 70ng/L as PFOS+PFOA. In Canada, standard values are 600ng/L as PFOS and 200ng/L as PFOA. In Germany, advisory value is 300ng/L as PFOS+PFOA. And International Agency for Research on Cancer evaluated PFOS as probably not carcinogenic and PFOA as possibly carcinogenic to human.

Water treatment and analytical method

Most popular removal way is activated carbon method, dosing PAC or GAC filter basin are used with good removal rate. Anion exchange resin and reverse osmosis methods are also studied and show good result.

Analytical method for PFOS and PFOA is liquid chromatograph mass spectrometry (LCMS) method.

(Answerer: Mr. Sasayama Hiroshi, Water Supply GLP Auditor)