

JYAVUSU is a manufacturer of dry cleaning machines. We welcome the opportunity to submit our opinion to the public consultation on all poly- and perfluoroalkyl substances (PFAS).

[Application for addition of new usage]

Dry cleaning is a new application not listed in the proposed regulation. Dry cleaning does not use any water, but washes clothes with organic solvents. Washing with organic solvents can remove oil-based stains well. It is a gentle method of washing clothes that prevents loss of shape and minimizes the impact on the garment. In addition, dry cleaning machines have equipment that distills and regenerates organic solvents and collects volatile solvent gases, so the amount of solvent leaking outside the equipment is extremely small.

Hydrocarbon solvents, chlorinated solvents, and fluorinated solvents are used as dry-cleaning solvents. Hydrocarbon solvents are highly flammable and cannot be used where the risk of fire should be avoided. In addition, chlorinated solvents (such as tetrachloroethylene) have toxicity problems such as carcinogenicity. Because fluorinated solvents are nonflammable and have low toxicity, fluorinated solvents are essential in dry cleaning applications.

[Request for exemption]

For example, cis-1-chloro-3,3,3-trifluoropropene (hereafter referred to as 1233Z) is used as a fluorinated solvent for dry cleaning. Note that 1233Z is the fluorinated solvent (CAS RN: 99728-16-2) with a boiling point of 39°C.

1233Z is not readily biodegradable according to an OECD TG301D study. It is likely to partition to the water rather than to the sediment and soil compartments as it has a relatively low partition coefficient ($\log P_{ow} = 2.3$). Furthermore, the high vapor pressure (49kPa at 20°C) suggests that the substance will volatilize rapidly from water and partition to the air. The rapid degradation of the substance in the air is supported by a publication from Sulbaek Andersen et al. (2018)¹, which shows a lifetime of 12 days by its reaction with OH in the air. Based on all the evidence, it is concluded that the substance is not persistent and bioaccumulative.

1233Z is expected not to be mutagenic since it is negative in the Ames test of OECD TG471 and also negative in the chromosome aberration test of OECD TG473. The substance is also expected to have low toxicity to humans since the LC50 (rat) is >51,000ppm in the acute inhalation test of OECD TG403 and the NOAEL = 5,000ppm in the 90-day repeated inhalation test of OECD TG413.

Reference 2 indicates that 1233Z has an ODP of less than 0.00034, a GWP of less than 1, and a POCP of 6.4. Therefore, in the concentrations expected in the environment its atmospheric degradation products will have a negligible impact on ecosystems. The substance does not adversely affect environmental problems such as ozone depletion and global warming, so it is environmentally

acceptable. Based on all hazard information, we would like to propose that 1233Z should not be regulated as a PFAS.

Hydrocarbon solvents and chlorinated solvents are candidates for PFAS alternatives, but hydrocarbon solvents are highly flammable and chlorinated solvents have toxicity problems such as carcinogenicity. The only solvents that can be safely used in dry cleaning applications are fluorinated solvents. We propose that the use of fluorinated solvents in dry cleaning applications be completely exempted from PFAS regulations.

1. Atmospheric Environment vol.179, 2018, P250-259
<https://doi.org/10.1016/j.atmosenv.2018.02.018>
2. Chemosphere vol.129, 2015, P135-141
<http://dx.doi.org/10.1016/j.chemosphere.2014.06.092>