STABILITY IN WATER (PHOTOLYSIS)

TEST SUBSTANCE

Identity: Perfluorooctanoic acid, ammonium salt; may also be referred to as PFOA ammonium salt, Ammonium perfluorooctanoate, FC-116, FC-126, FC-169, or FC-143. (Octanoic acid, pentadecafluoro-, ammonium salt, CAS # 3825-26-1)

Remarks: 3M production lot number 332. The test substance is a white powder at 25°C.

METHOD

References: Based on OPPTS: 835.5270 and OECD Draft Document "Phototransformation of Chemicals in Water - Direct and Indirect Photolysis", August 2000.
GLP (Y/N): No, but many GLP procedures were employed.
Year completed: 2001
Type: Direct and Indirect Photolysis
Light source: Suntest CPS+ or Suntest XLS+ lamp
Light intensity: 680 w/m^2
Wavelength range: 290-800 nm
Duration: 69.5 to 164 hours
Test matrices:

Direct: Water (pH 7 buffered)
Indirect: H_2O_2/water (1:1 molar equivalent)
Soil/dilute aqueous $CaCl_2$ solution (0.7 g/5mL) (3 soil types – loam, clay loam, sandy clay loam)
Soil/dilute aqueous CaCl2 solution with H_2O_2
Fe_2O_3/water (Fe^{3+} at 24X molar excess)
Fe_2O_3/water with H_2O_2,
Commercial (Aldrich) humic material prepared as in OPPTS 835.5270

Each of the above direct and indirect test matrices included a series of unexposed controls (kept in the dark) for the evaluation of any degradation reactions occurring without the presence of light.

Temperature: 25±3°C

Test sample preparation: Aliquots of PFOA were added to three separate sets of VOA screw cap vials (exposed, unexposed, and control vials) containing 5 ml of appropriate matrix. Test vials were placed in the photoreactor. Control vials were wrapped in aluminum foil, sealed in a plastic bag, and placed in the photoreacter.

Analytical Procedures: A UV/Vis spectrum of a saturated aqueous solution of PFOA was recorded between 190 and 110 nm. Samples were analyzed by quantitative LC/MS and GC/MS techniques.

RESULTS

Degradation and breakdown products: No conclusive evidence of direct or indirect photolysis of PFOA was observed under any of the conditions tested. Direct photolytic decomposition of PFOA was not observed based on loss of starting material, nor were any of the predicted degradation products detected above their limits of quantitation. There was a slight increase in perfluoroheptanoic acid concentration in the matrix containing Fe^{+3} and H_2O_2. However, this increase may have been caused by indirect photolysis of an unknown impurity in the PFOA test material.

Data obtained from the Fe_2O_3 matrix samples (with and without H_2O_2) were pooled to provide sufficient statistical data to estimate the minimum half-life. The mean and standard deviation of these data indicate that the minimum environmental half-life of PFOA due to indirect photolysis at 25°C is greater than 349 days.

CONCLUSIONS

No conclusive evidence of direct or indirect photolysis of PFOA was observed under any of the conditions tested. Data obtained from the Fe_2O_3 matrix samples (with and without H_2O_2) were pooled to provide sufficient statistical data to estimate the minimum half-life. The mean and standard deviation of these data indicate that the minimum environmental half-life of PFOA due to indirect photolysis at 25°C is greater than 349 days.

Submitter: 3M Company, Environmental Laboratory, P.O. Box 33331, St. Paul, Minnesota, 55133

DATA QUALITY

Reliability: Klimisch ranking: 2
Remarks: Study was well conducted, though not under GLP.

REFERENCES

This study was conducted at the 3M Environmental Laboratory under Lab Request Number E00-2192. See 3M Environmental Laboratory Report No. E00-2192 (dated April 20, 2001).

OTHER

Last Changed: June 22, 2001