BIODEGRADATION (Pure Microbial Cultures)

TEST SUBSTANCE

Identity: Perfluorooctanesulfonate; may also be referred to as PFOS or FC-95. (1-Octanesulfonic acid, 1,1,2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-heptadecafluoro-, potassium salt, CAS # 2795-39-3)

Remarks: The 3M production lot number was 217 (TN-A-2130). The test substance is a white powder. Purity determined to be 86.9% by LC/MS, ^{1}H-HMR, ^{19}F-NMR and elemental analyses techniques subsequent to analyses cited in the attached report.

METHOD

Method: Springborn Laboratories, Inc./Betts *et al*, 1974, two study types:
Pure Culture
Closed Vial Headspace
Test Type: Aerobic
GLP: No
Year completed: 2000

Pure Culture Studies
Contact time: 7-days
Inoculum: 4 separate pure cultures tested:
Cunninghamella echinulata var. echinulata (fungi, ATCC #9244)
Mucor circinelloides f. griseocyanus (fungi, ATCC #1207a)
Phanerochaete chrysosporium (fungi, ATCC #24725)
Streptomyces griseus (actinomycete, ATCC #13273)
Source: American Type Culture Collection (ATCC)
Inoculum loading in test vessels: 6 mL of Stage II cultures into 60 mL media, allowed 24-hr of agitation prior to PFOS addition
Test medium: soybean grits-glucose (SGG)
Test concentrations: ~20.9 mg/L (nominal)
Study design:
Inoculum control: media, inoculum
Test: media, inoculum, PFOS stock solution
Incubation conditions
Temperature: 26°C
Agitation: Shaker table at 250 rpm
Test vessels: Not noted
Dosing procedure: Each test flask received all necessary components at test initiation. All work utilized strict aseptic technique until harvest at Day 7.

Sampling frequency: Day 0 and 7
Analytical method: Separation of broth and cells via centrifugation. Analysis of both by LC/MS

Closed Vial Headspace Study:

Contact time: 3-days
Inoculum: *Phanerochaete chrysosporium* (fungi)
Inoculum source: American Type Culture Collection (ATCC)
Initial inoculum loading in test vessels: not noted
Test medium: soybean grits-glucose (SGG) medium at 1/10 and 1/100 strength plus resazurin
Test concentration: 0.2 mg/L.
Study design:

Inoculum control: media, inoculum
Abiotic control: media, PFOS (not sterile)
Test: media, PFOS, inoculum

Incubation conditions

Temperature: 26°C
Agitation: Shaker table, in environmental chamber, at 250 rpm
Test vessels: 22 mL sterile vials

Dosing procedure: Each test flask received all necessary components at test Initiation. Headspace purged with oxygen, vial immediately crimped.
Sampling frequency: Once – Day 3
Analytical method: Separation of broth and cells via centrifugation. Analysis of both by LC/MS

Remarks: Stock solutions used to dose the biodegradation test systems were prepared at a concentration of 1,060 mg/L (Pure Culture Study) and 1,011 mg/L (Closed Vial Study). These concentrations are approximately twice the water solubility of PFOS,

RESULTS

The studies with *Cunninghamella, Mucor,* and *Streptomyces* did not provide any indication of biotransformation of PFOS.

Preliminary analytical results of the first *Phanaerochaete* study indicated possible biotransformation of PFOS (90% mass balance). Therefore, closed vial studies were set up to confirm. Difficulties were encountered in maintaining aerobicity, and only 3 days of exposure were maintained.

The results from the closed vial study indicated no significant biotransformation of PFOS by *Phanaerochaete* fungi.

CONCLUSIONS

It does not appear that the four species studied are capable of metabolizing PFOS.

DATA QUALITY

Reliability: Klimisch ranking = 2. The stock solution used to dose the systems was prepared at twice the water solubility. There were no initial measured concentrations taken in the closed vial study. These studies were not conducted in accordance with the principles of Good Laboratory Practices.

REFERENCES

This study was conducted at Springborn Laboratories, Inc., Wareham, Massachusetts at the request of the 3M Company. Report completed 11/3/00. Lab Project number E01-0434.

OTHER

Last changed: 6/12/01