



FAMU-FSU Engineering

FAMU - FSU COLLEGE OF ENGINEERING DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Technical Awareness Group (TAG) Meeting No. 1
Friday, December 6, 2024, 3:00 – 4:00 pm Eastern Time
Meeting location: Zoom

Project Title: Permeation of Fluorotelomer Alcohols through Landfill Covers and Liners

TAG Members: Joseph Dertien (Florida Department of Environmental Protection), Walsta Jean-Baptiste (Florida Department of Environmental Protection), Shanin Speas-Frost (Florida Department of Environmental Protection), Owete S. Owete (Florida Department of Environmental Protection), Chao Zhou (Geosyntec Consultants), Bruce Marvin (Geosyntec Consultants), Kevin M. Warner (Geosyntec Consultants), Terry Johnson (Waste Management Inc.), Xia Cao (GCP Applied Technologies Inc.), Sterling Carroll (Florida Rural Water Association), Mike Chase (Florida Rural Water Association), Peyton Piotrowski (Florida Rural Water Association), Paul E. Seaver (Palm Beach Springs Water Company Inc.), Natalia Soares Quinete (Florida International University), Timothy G. Townsend (Hinkley Center for Solid and Hazardous Waste Management), Steven J. Laux (Hinkley Center for Solid and Hazardous Waste Management), Hannah Sackles (Hinkley Center for Solid and Hazardous Waste Management)

Principal Investigator: Youneng Tang

In Attendance: Mojtaba Nouri Goukeh (FAMU-FSU College of Engineering), Youneng Tang (FAMU-FSU College of Engineering), Joseph Dertien (Florida Department of Environmental Protection), Walsta Jean-Baptiste (Florida Department of Environmental Protection), Shanin Speas-Frost (Florida Department of Environmental Protection), Owete S. Owete (Florida Department of Environmental Protection), Chao Zhou (Geosyntec Consultants), Bruce Marvin (Geosyntec Consultants), Kevin M. Warner (Geosyntec Consultants), Terry Johnson (Waste Management Inc.), Xia Cao (GCP Applied Technologies Inc.), Mike Chase (Florida Rural Water Association), Peyton Piotrowski (Florida Rural Water Association), Paul E. Seaver (Palm Beach Springs Water Company Inc.), Natalia Soares Quinete (Florida International University), Timothy G. Townsend (Hinkley Center for Solid and Hazardous Waste Management), Hannah Sackles (Hinkley Center for Solid and Hazardous Waste Management), Sherry Carpenter (Keep Florida Beautiful), Dennis Ssekimpi (FAMU-FSU College of Engineering), Maeve Storm (FAMU-FSU College of Engineering), Sabrina Clark (FAMU-FSU College of Engineering)

Presentation by Mojtaba Nouri Goukeh:

Mojtaba Nouri Goukeh (research assistant of this project) started the presentation at 3:00 PM. He discussed the issue of groundwater contamination caused by landfills and explained how bottom liners, particularly composite liner systems, play a crucial role in minimizing the risk of groundwater pollution. He highlighted the importance of geomembranes and the main types, including high-density polyethylene (HDPE). He summarized the main studies of permeation through HDPE and linear low-density polyethylene (LLDPE) membranes. Then he noted that previous studies found that HDPE membranes are effective in keeping high soluble PFAS in landfills. He added that there are currently no studies on the permeation of volatile PFAS like FTOHs (high volatility, low solubility) through membranes.

He then summarized the four tasks of the project:

Task 1 - Permeation experiments: Determine how FTOHs pass through the membrane.

Task 2 - Permeation modeling: Determine the breakthrough time, diffusion coefficient, partition coefficient, and permeation coefficient.

Task 3 - Low FTOH concentration experiment: Determine how FTOHs pass through the membrane at low concentrations.

Task 4 - Vapor-phase experiment: Determine how FTOH vapor passes through the membrane.

He elaborated on each Task and presented the preliminary data obtained in Task 1.

He explained that in Task 1, two reactors (source and receptor) are separated by FTOH membrane and placed in a heated bath. The permeation of FTOHs at 500 µg/L is measured at target temperatures of 40, 50, 60, and 70°C. Then, he explained based on preliminary data at 60°C, the concentration in source decreased from 500 µg/L to 300 µg/L for short chain FTOH in 12 days. However, long chain FTOH had a sharper decline in concentration. He mentioned that the adsorption to the membrane was consistent with the octanol-water partition coefficient (K_{ow}), and long chain FTOH have higher K_{ow} and adsorption rates.

Then, he introduced Task 2. Task 2 will integrate data from Task 1 into models based on four modeling parameters: (1) Standardized Breakthrough time, (2) Diffusion coefficients, (3) Partition coefficients, (4) Permeation coefficients. Then, he mentioned the importance of conducting experiment at low concentration because FTOH are found in landfills at low concentrations (Task 3). Finally, he emphasized the importance of understanding how FTOH vapor permeate through the membrane. He mentioned Task 4 will evaluate the permeation of FTOH through the membrane at 100 µg/L at 70°C.

Group Discussion:

Major questions, comments, suggestions, and discussion from the TAG:

- There is a question about the research team's plan for the three scheduled TAG meetings. Answer from the research team: The first meeting is an introduction, the second meeting will be to share experimental results, and the final meeting will be to share findings. The

team will use feedback from TAG results; feedback is helpful because Task 3 and Task 4 were added based on previous suggestions.

- There is a question about the reasoning for the selected source concentration. Answer from the research team: A high concentration allows the research team to more easily view results, but the concentration cannot be raised because of low solubility of FTOH.
- There is a suggestion to compile the findings of all PFAS research projects. A statewide meeting or conference are discussed as possibilities.
- There is a question about the reason for selecting FTOH specifically. Answer from the research team: soluble PFAS have already been researched; volatile PFAS have different properties from previously researched PFAS. Research has not been done on volatile PFAS permeation through membrane, and FTOH is a dominant group of volatile PFAS.
- There is a question about Task 3 (low FTOH concentration experiment) and the measurement method that will be used. With GC/MS, there are often difficulties with volatile substances and trap. Answer from the research team: The team is using SPME, which uses fibers to adsorb and does not need to adsorb all target compounds. The internal standard is added to increase data quality, so both the internal standard and target compounds are measured and the results come from the ratio between them.
- There is a question about if the modeling results will inform of the timescale for Task 3, the low concentration experiment. Answer from the research team: Yes; the modeling will be used for the low concentration experiment.
- There is a comment that the Task 4 results may have relevance for vapor intrusion into existing or new structures, and there is an interest in FTOH in indoor air.

The meeting was adjourned at 3:47 pm. Minutes taken and submitted by Maeve Storm.