Evidence of 8:2 FTOH Production From the Biodegradation of 8:2 Telomer Methacrylate Under Aerobic Conditions

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INTRODUCTION

• 8:2 FTOH found to degrade under aerobic conditions forming telomer acids and perfluorinated acids as metabolites
• Reactivation of 8:2 FTOH with pyruvate forms 8:2 methacrylate, a monomer used in certain fluoropolymers.
• 8:2 methacrylate found to contain 0.04% residual alcohols

OBJECTIVE OF STUDY

• To determine whether a fluorinated monomer can degrade under aerobic conditions using sewage treatment plant microorganisms as the inoculum.
• To identify metabolites in the degradation process

MATERIALS AND METHODS

CLOSED DEGRADATION EXPERIMENT

• Due to volatility of monomer observed in purge experiment, a closed degradation experiment was performed.
• 10mL of 8:2 methacrylate was added to 250mL bottles filled with 125mL defined mineral media and capped with mininnert valves.
• 2% vol/vol of inoculum obtained from Ashbridges Bay Sewage Treatment Plant (Toronto, ON) was added.
• Vessels were stored at room temperature.

ANALYSIS FOR VOLATILE METABOLITES

• 1.2mL of aqueous samples are extracted with 3 x 2mL aliquots of ethyl acetate and analyzed using GC/MS.

ANALYSIS FOR NON-VOLATILE METABOLITES

• 3mL aqueous samples are extracted using the ion-pairing

RESULTS

• 8:2 methacrylate also found trapped in XAD, hence being purged out of the vessels.
• 8:2 FTOH detected in active vessels and small amounts detected in sterile controls.
• 8:2 methacrylate still detected in aqueous samples after termination of experiment hence, not completely depleted from vessels.
• Thermal decomposition of monomer was determined to not be the cause of FTOH production.

8:2 FTOH production in active vessels (n=3) and sterile control in methacrylate biodegradation purge experiment.

CONCLUSIONS

• Optimize method for quantification of the 8:2 methacrylate to establish accurate rates of degradation.
• Perform degradation experiments of polymers to determine whether fractionation of fluoropolymers through biodegradation is a source of significant production of perfluorinated acids found in the environment.

REFERENCES


FUTURE WORK

• Perform degradation experiments of fluoropolymers to determine whether fractionation of fluoropolymers through biodegradation is a source of significant production of perfluorinated acids found in the environment.