

What are PFAS?

- Perfluoroalkyl substances are chemicals containing strong bonds
- PFAS do not break down naturally
- PFAS can cause cancer and liver damage
- Used in fire and water retardant materials
- Rising presence in bodies of water over the last 50 years
- No current simple and economical way to remove PFAS from water
- Perfluorooctanoic acid (PFOA) as a model compound for PFAS:

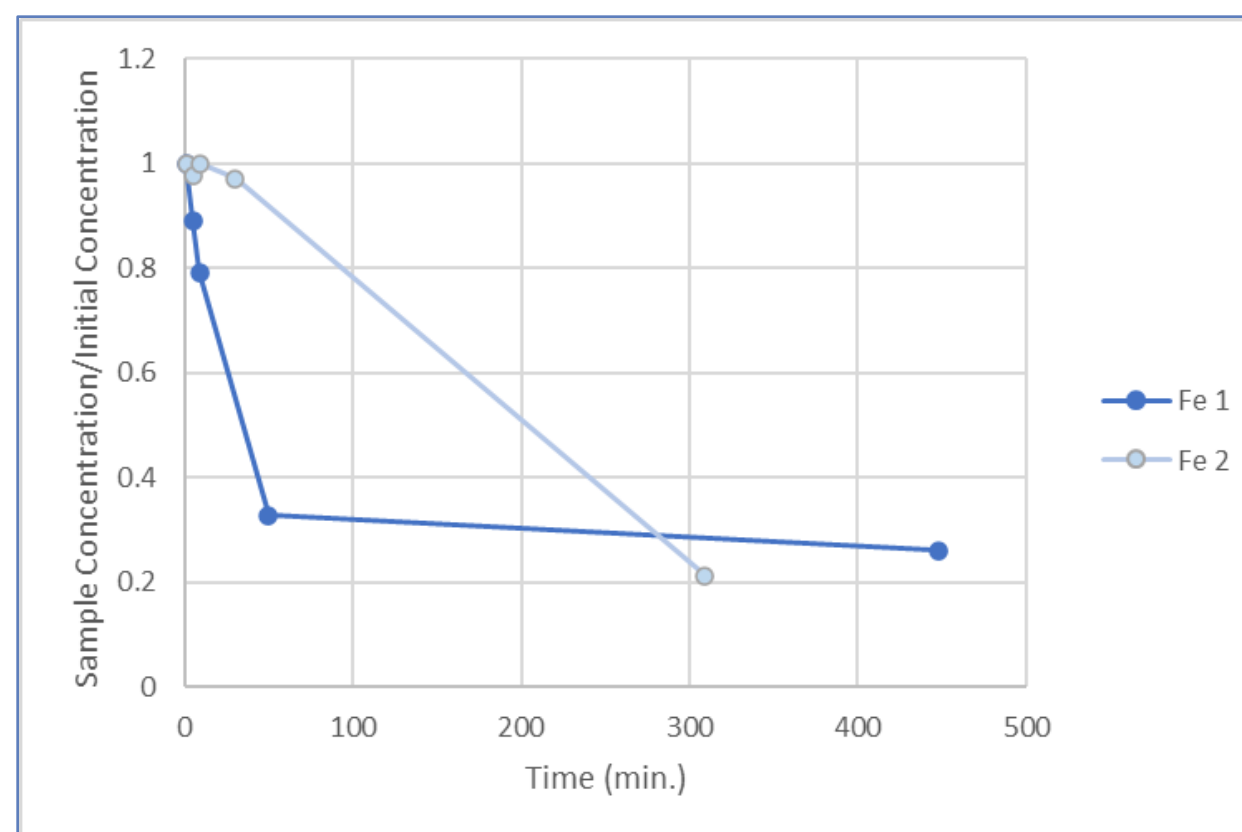
(c_{in} = 600 ng/L)



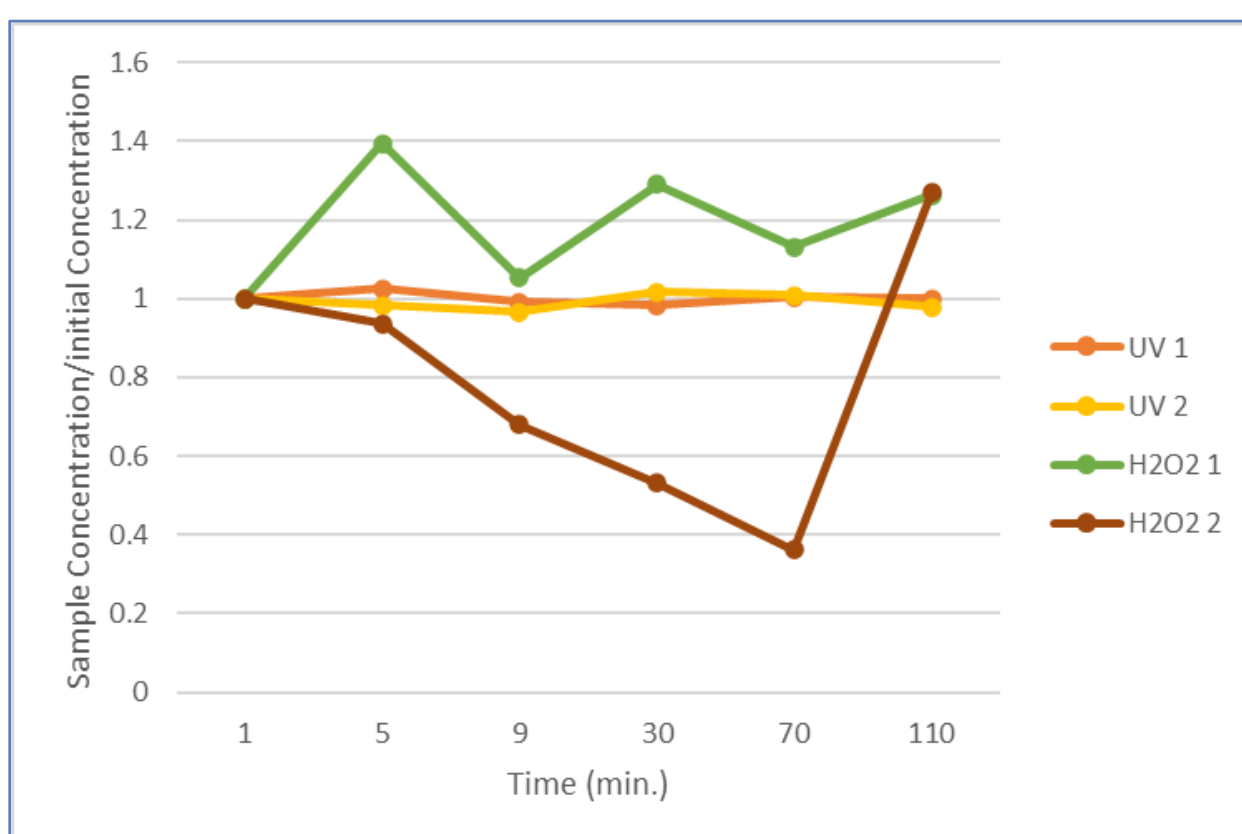
Analytical Method for PFOA

- PFOA (isotope labeled) determined by Waters Acquity-H Ultra-HPLC system coupled with Waters Xevo TQ-XS triple quadrupole mass spectrometer (UPLC-MS/MS).
- The analytes were separated by a Waters CORTECS UPLC C18 (100 mm x 2.1 mm; 1.6 μ m particle size) reverse-phase column. Mobile phase consisted of 100% acetonitrile (A) and 0.01% formic acid and in MilliQ water.

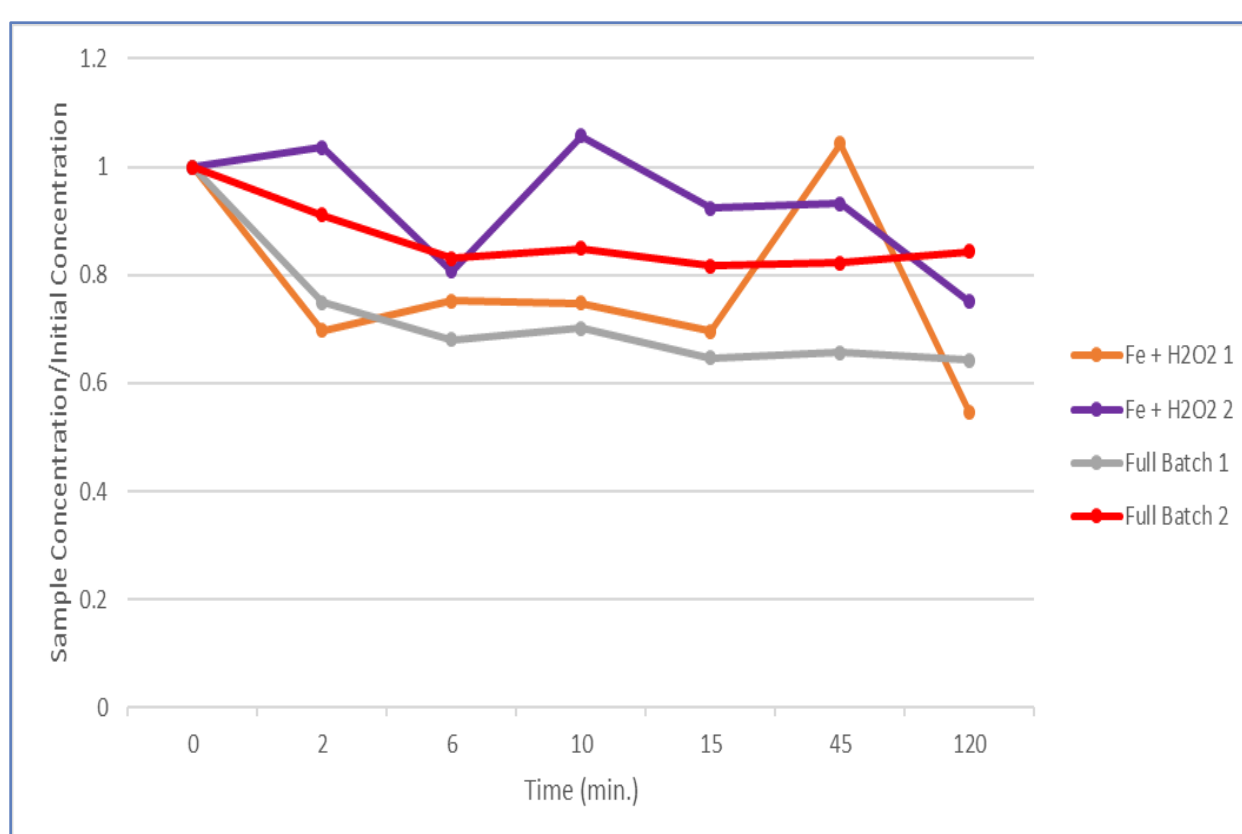
Results



% of initial PFOA concentration as a function of time. Fe trials: iron oxide (1 g/L) + PFOA (600 ng/L)



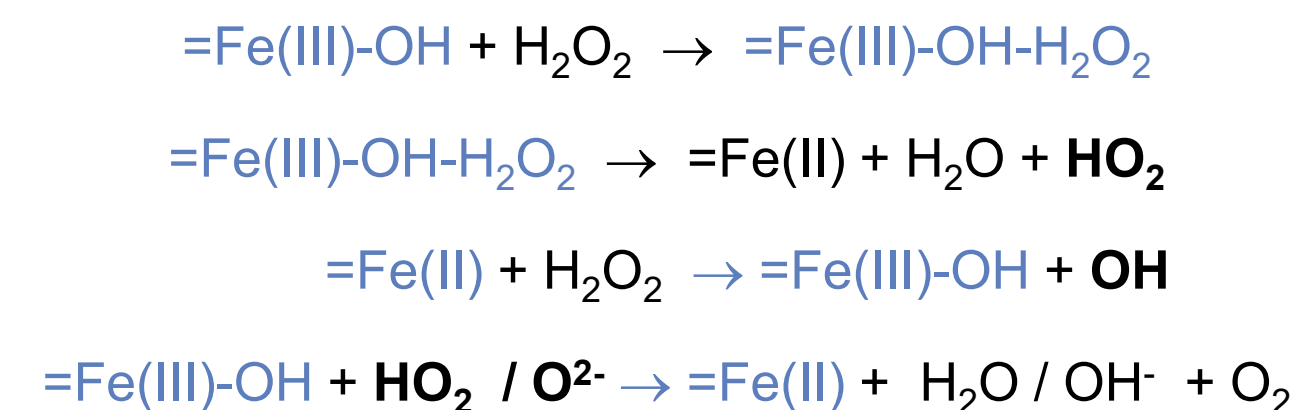
% of initial PFOA concentration as a function of time. UV trials: PFOA (600 ng/L) exposed to UV light. H₂O₂ trials: H₂O₂ (100 mmol/L) + PFOA (600 ng/L)



% of initial PFOA concentration as a function of time. Fe + H₂O₂ trials: iron oxide (1 g/L) + PFOA (600 ng/L) + H₂O₂ (100 mmol/L). Full batch trials introduce UV light exposure to Fe + H₂O₂ trials.

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Heterogeneous Photo Fenton Reactions



- Neutral pH ; Catalyst is reused and can be fixed
- Requires UV light (365 nm)
- Challenge:** high reactive, short lived OH*
- Iron oxide:** sintered at 400C to convert to hematite

Future Research

- Determine efficiency of reaction under different conditions of H₂O₂ conc.
- Fabricate supported catalyst
- Continuous reaction mode

