

October 2012

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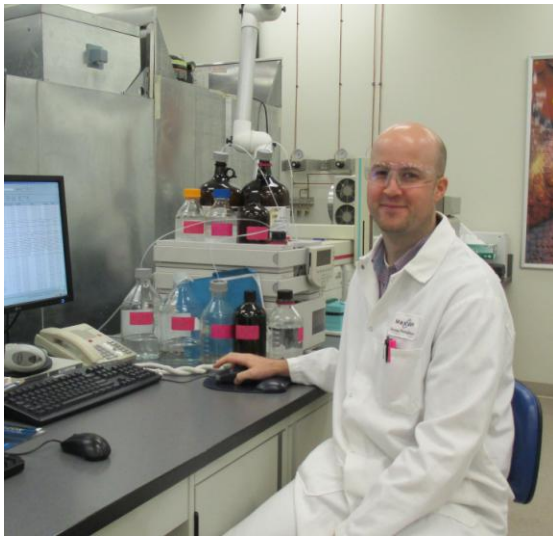
Aqueous Sample Stability: PFOS, PFOA and Other Fluorinated Compounds

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Maxxam

ACKNOWLEDGMENTS

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Adam Robinson



Sin Chii Chia

‘The most exciting phrase to hear in science, the only one that heralds new discoveries, is not "Eureka!", but rather...

"Hmm... that's funny...."

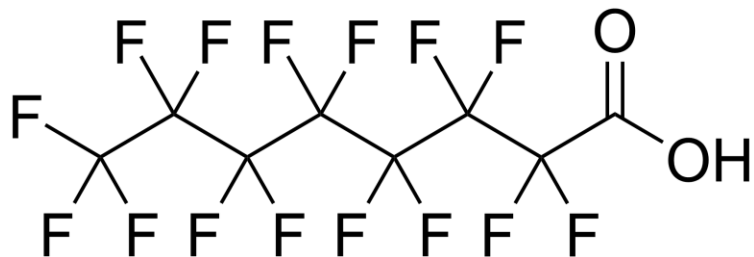
- Isaac Asimov

OVERVIEW

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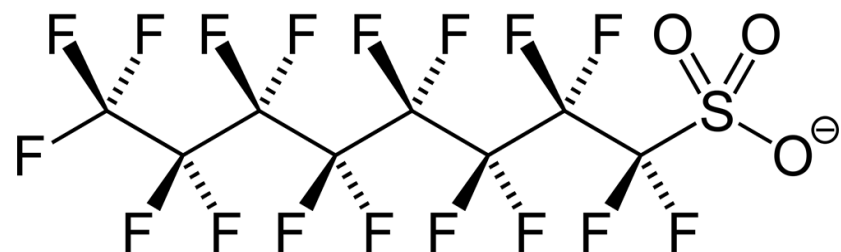
- Background
- Objectives
- Experimental Design
- Results
- Conclusions

What are they?



**Perfluorooctanoic Acid
(PFOA)**

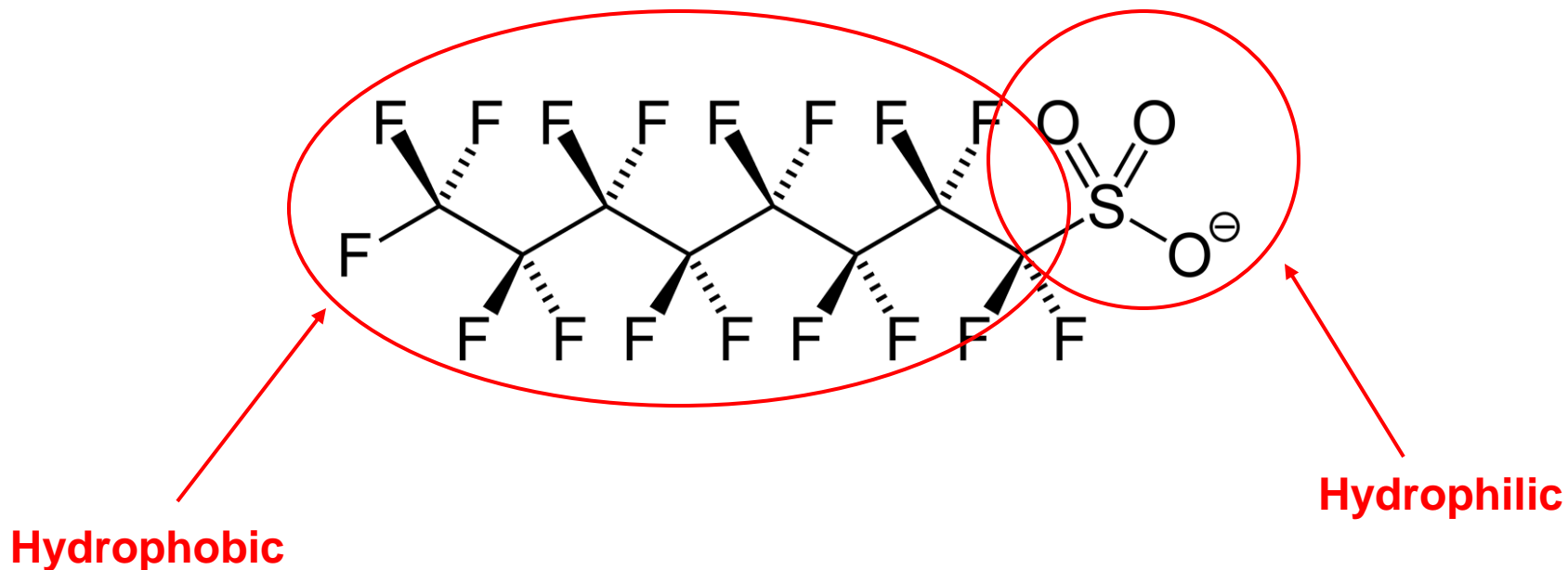
Teflon®



**Perfluorooctane Sulfonate
(PFOS)**

Scotchguard®

PFCs and Surfactants



**Perfluorooctane Sulfonate
(PFOS)**

Why do we care?

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Regulatory Limits – Drinking Water

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Jurisdiction	PFOA (ug/L)	PFOS (ug/L)
Canada – Health Canada	0.7	0.3
U.S.A - EPA	0.4	0.2
U.S.A. – Minnesota	0.3	0.2
U.S.A. – New Jersey	0.04	N/V
U.S.A. – North Carolina	2	N/V
Europe – United Kingdom	10	0.3
Europe - Germany	0.1 (sum of PFOA and PFOS)	

- Sample matrices range from simple to complex
- Adsorption of PFC onto surfaces can be rapid resulting in potential low bias in data
- PFOS data reproducibility of significant concern

- Data variability
- Lack of confidence in the results
- Inability to make supportable remedial decisions

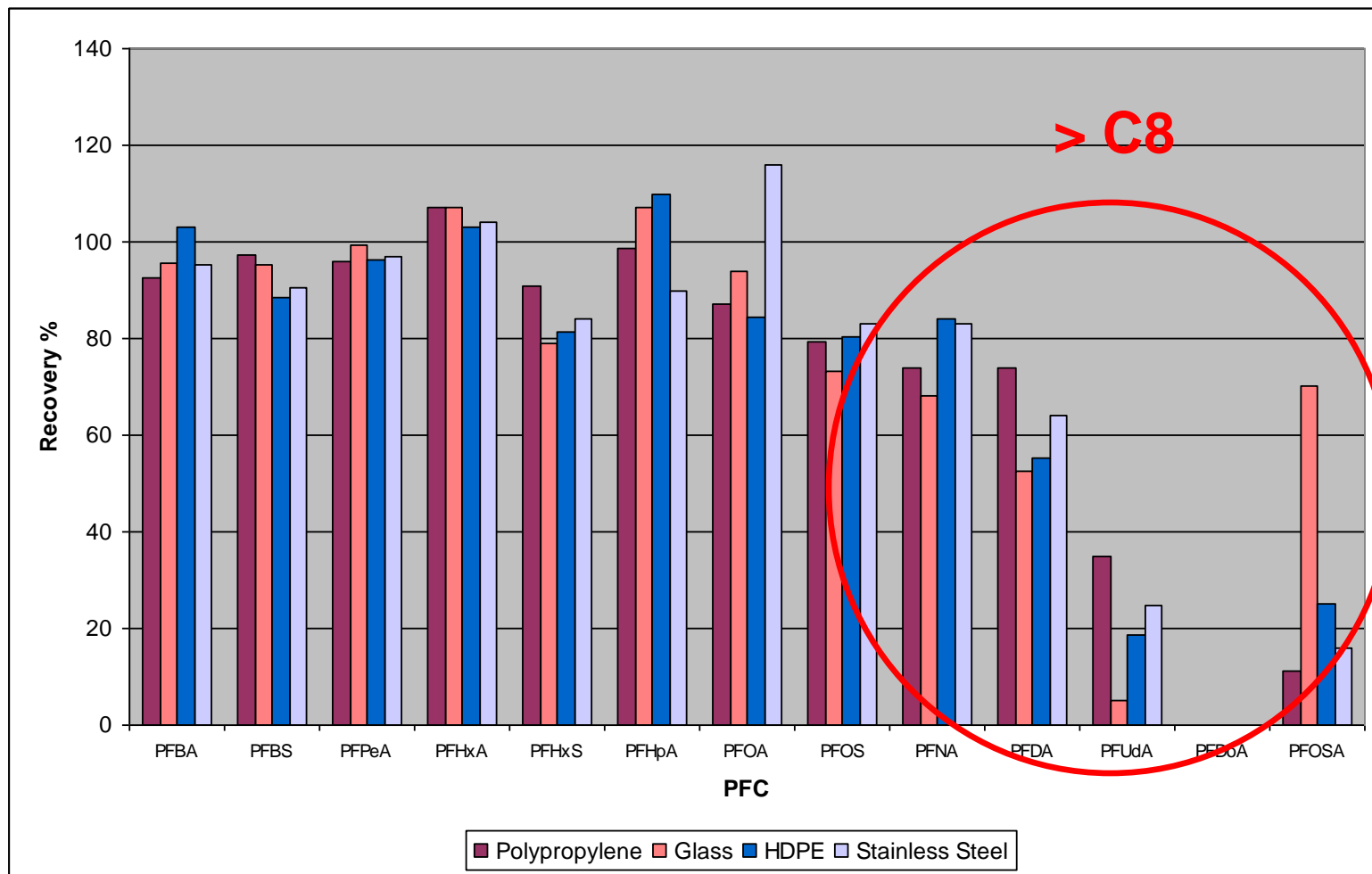
Study Objectives

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- Obtain a “practical” understanding of adsorptive behaviour of PFCs in aqueous samples
- Study adsorption based on:
 - Molecular weight
 - Sample container material
 - Multiple transfers
 - Time
 - Application of matrix modifiers
- Explore the effects of different conditions

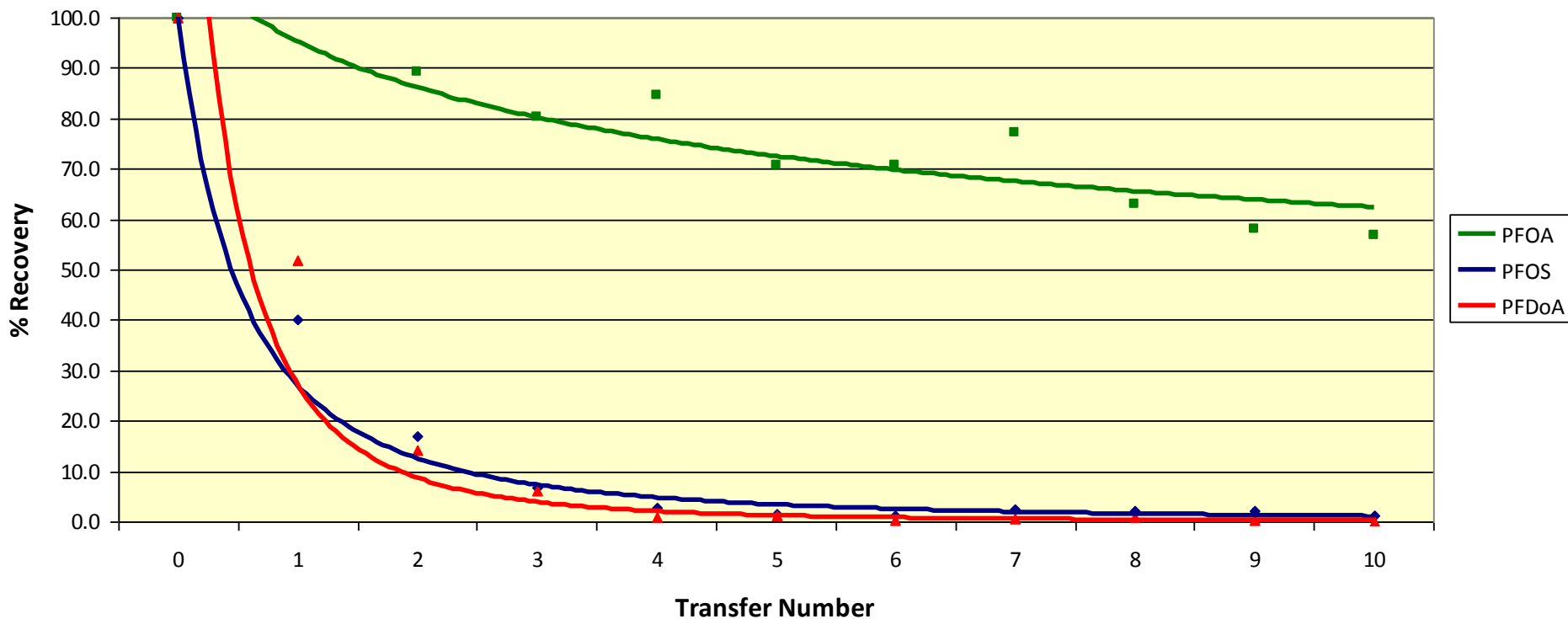
PFC Recovery Data: Container Material

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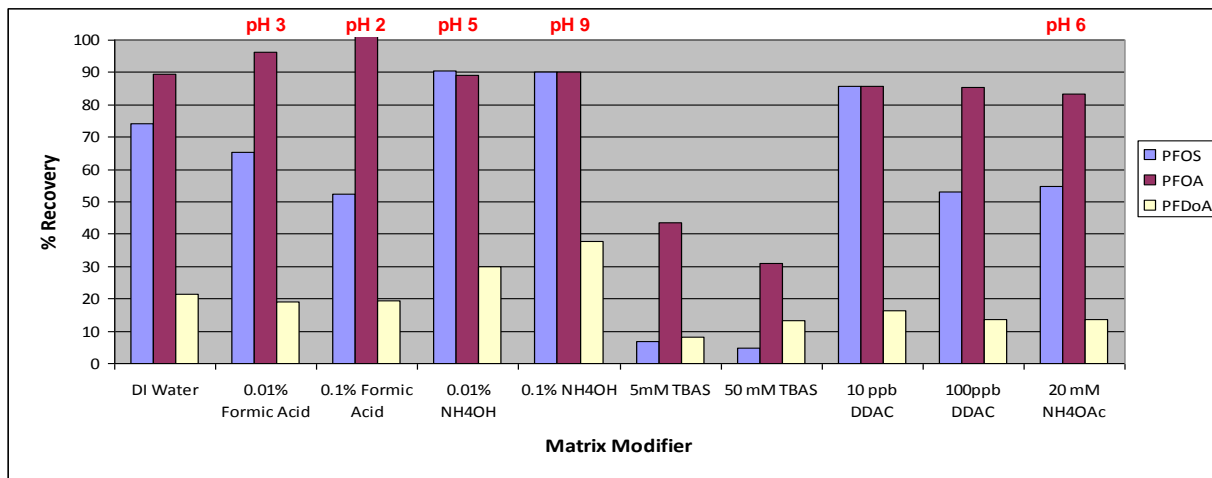
PFOS/PFOA/PFDoA Recovery: Consecutive Sample Transfers

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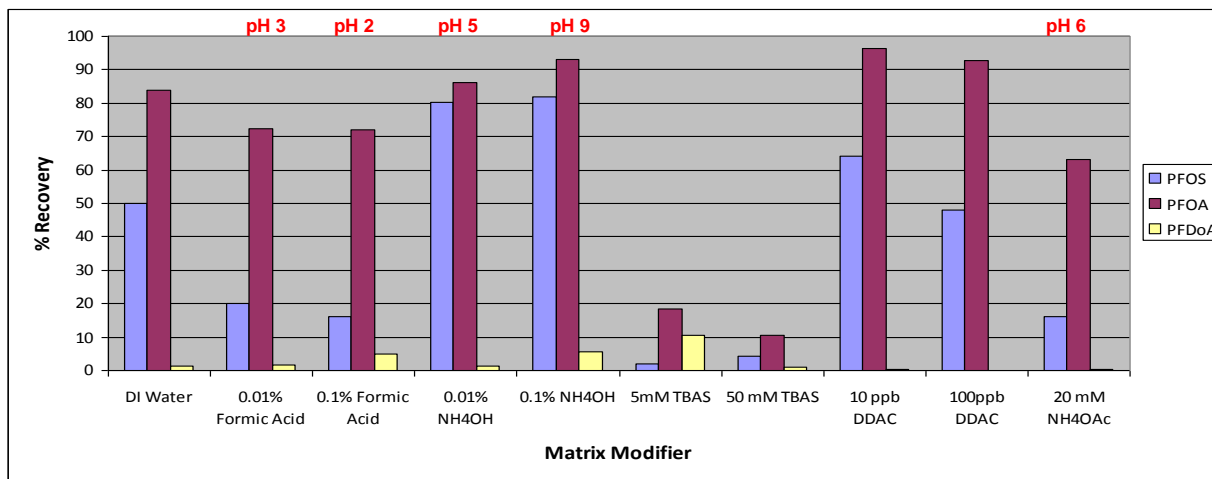


PFOS/PFOA Recovery: Aqueous Matrix Modifiers (pH)

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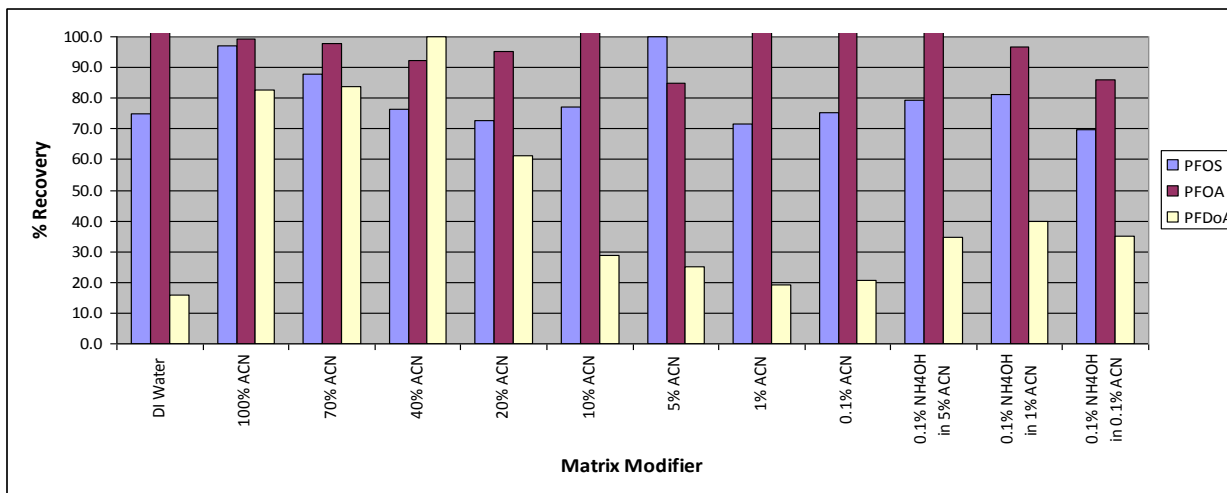
Polypropylene



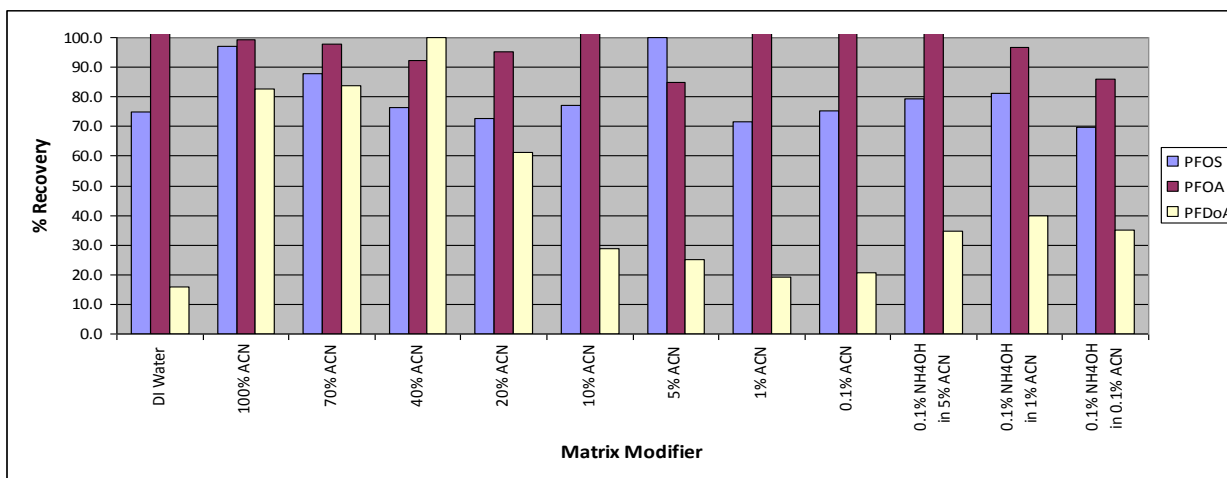
Glass

PFOS/PFOA/PFDaA Recovery: Organic Matrix Modifiers

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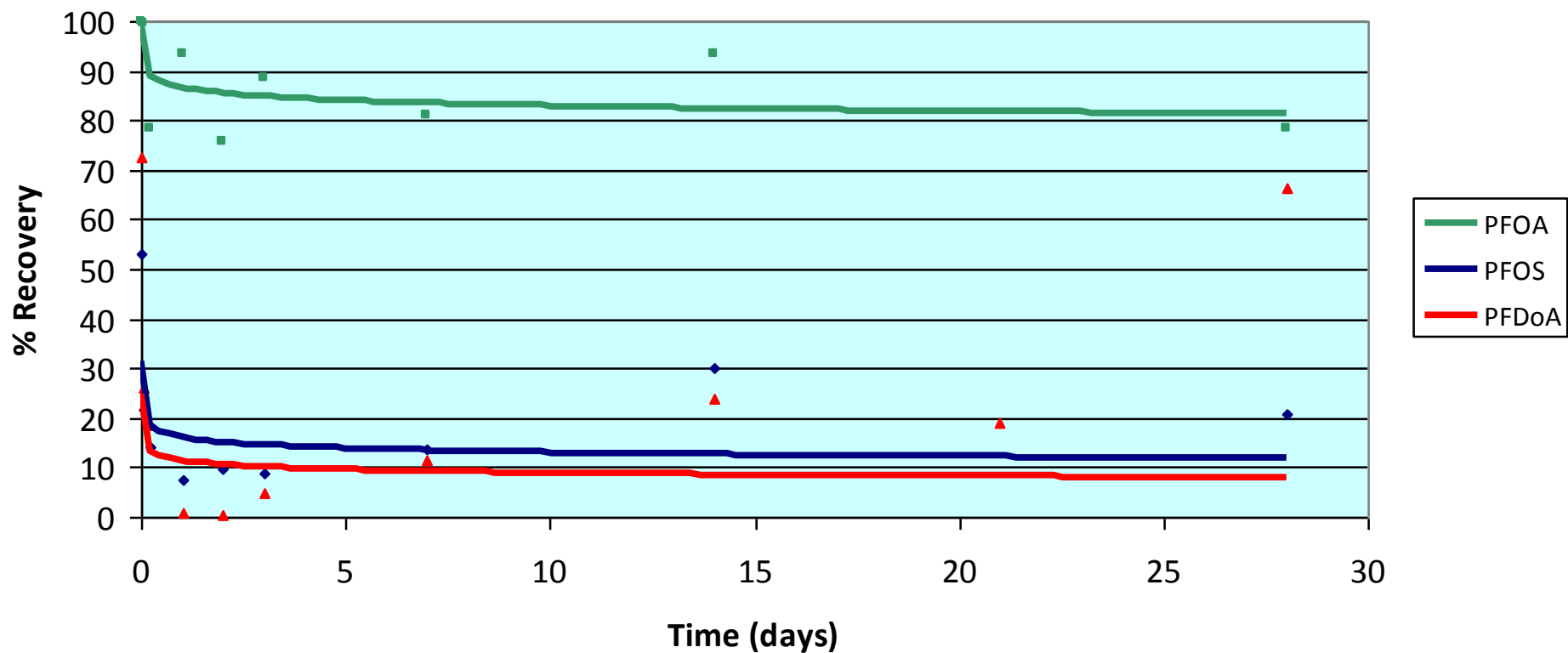
Polypropylene



Glass

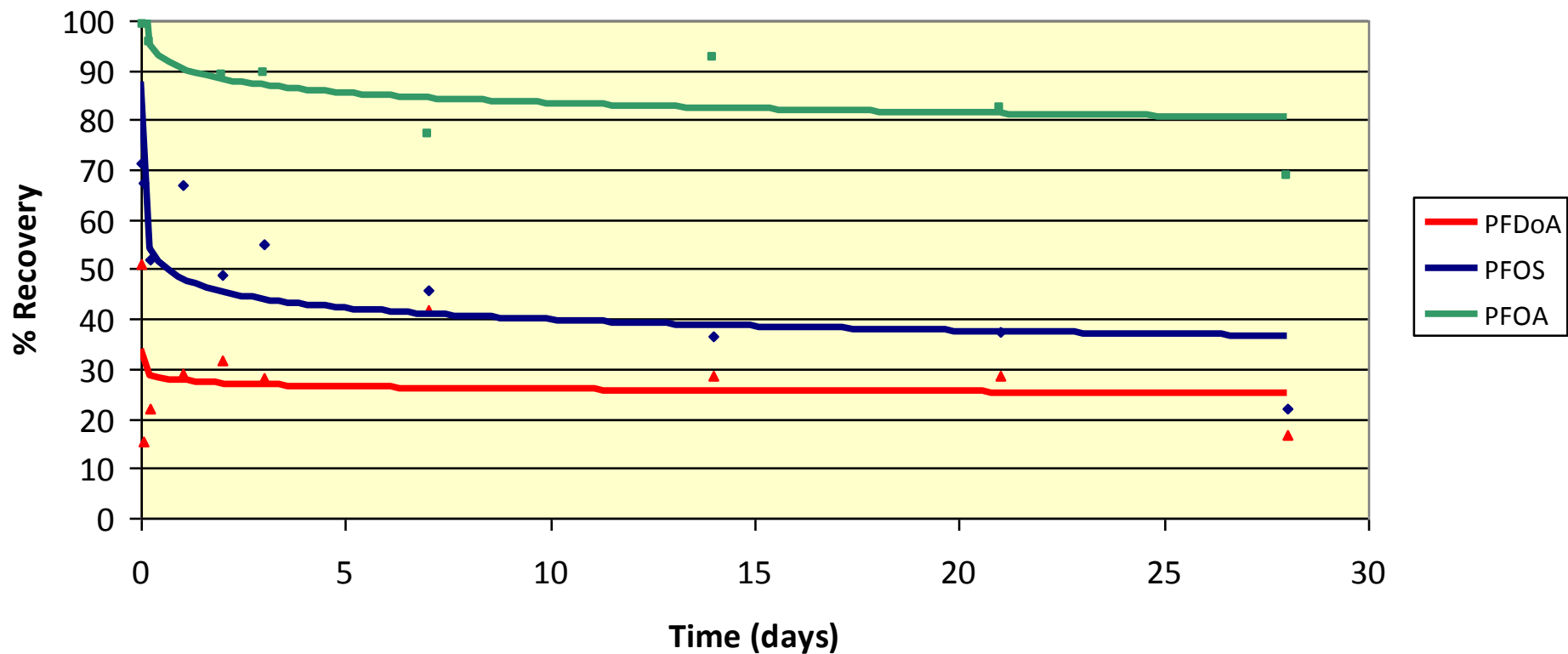
PFOS/PFOA/PFDoA Recovery: Time (SA/V Ratio ~ 20; HDPE)

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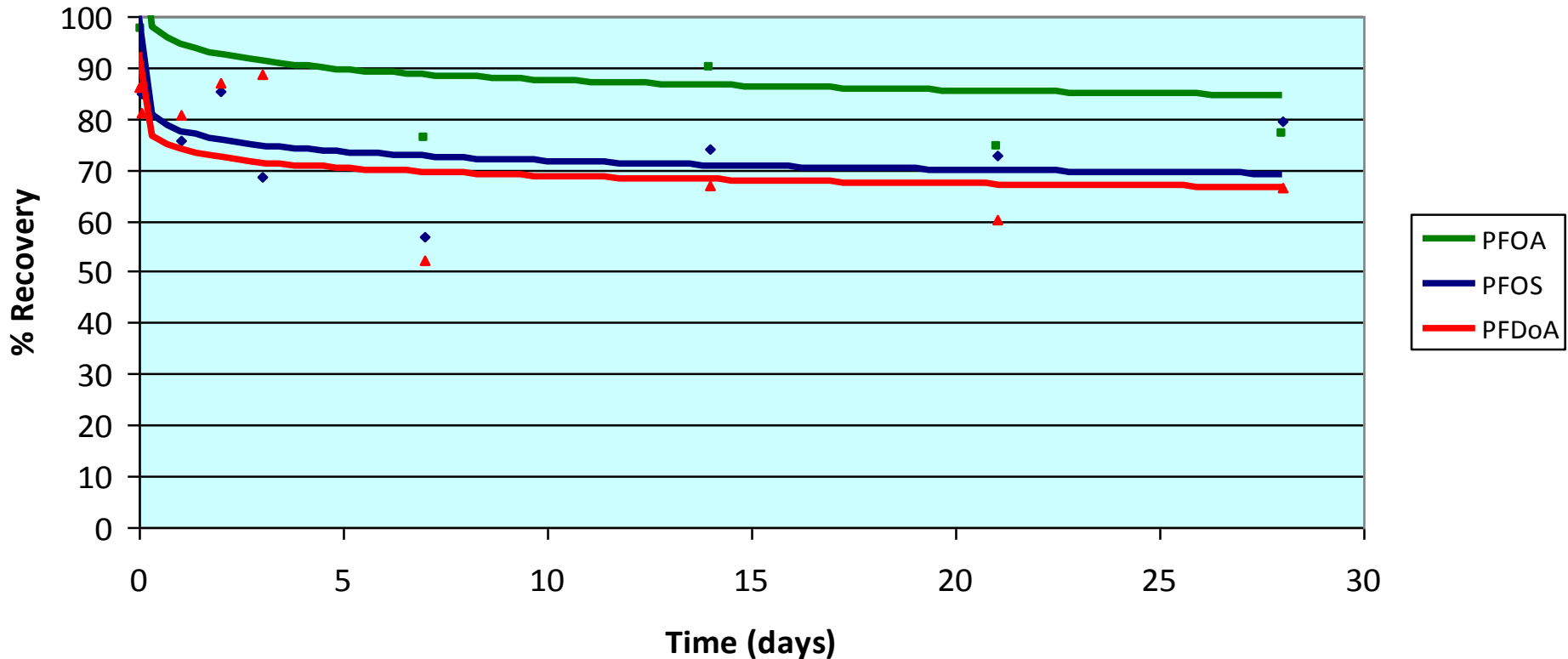
PFOS/PFOA/PFDoA Recovery: Time (SA/V Ratio ~ 20; Glass)

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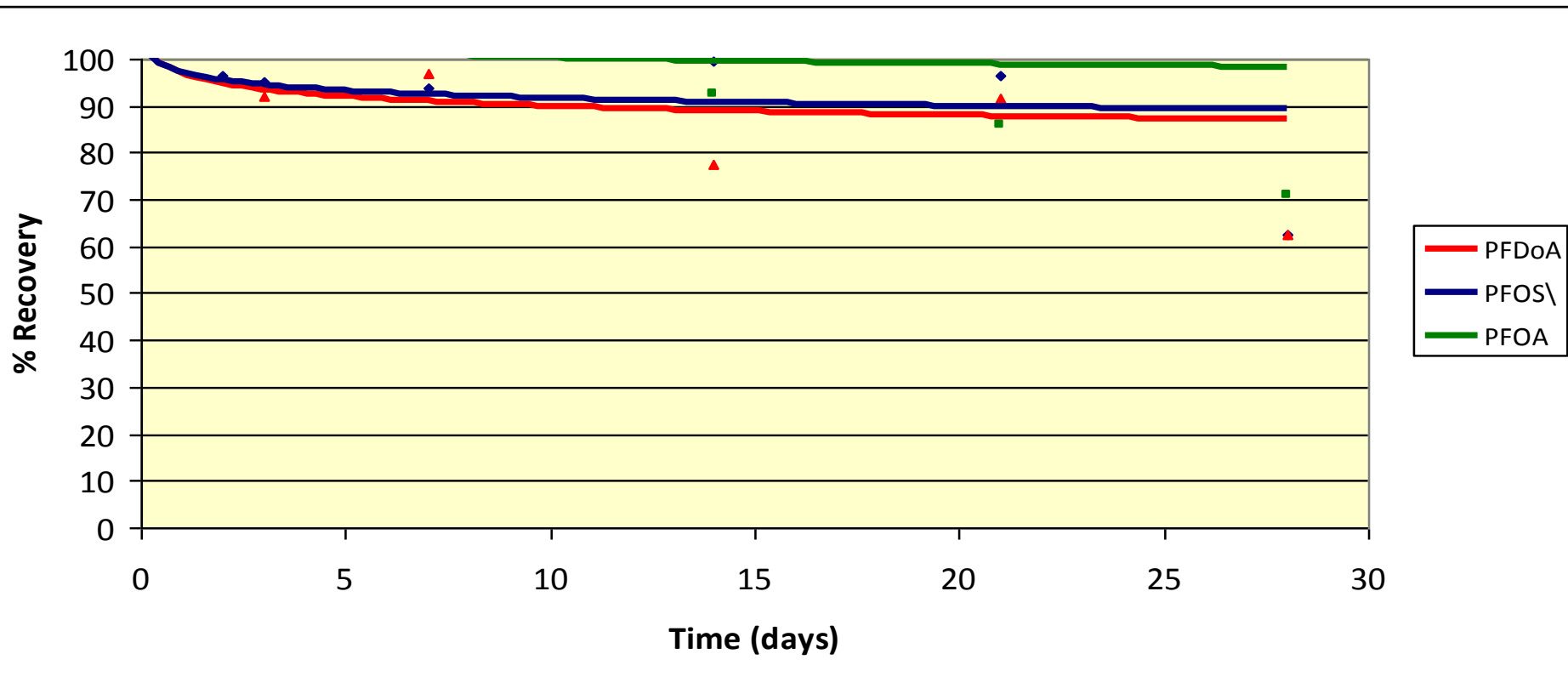
PFOS/PFOA/PFDoA Recovery: Time (SA/V Ratio ~ 0.5 ; HDPE)

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PFOS/PFOA/PFDoA Recovery: Time (SA/V Ratio ~ 0.5 ; Glass)

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- Significant adsorption appears to be independent of sample container material
- Degree of adsorption appears to be dependent on molecular weight. Significant adsorption can occur for >C8 telomers
- Adsorption appears to be less significant with perfluorinated carboxylates relative to the perfluorinated sulphonates

- Addition of an organic matrix modifier/preservative decreases adsorption
 - Field
 - Laboratory
- Surface area to volume ratio is an important consideration in collecting samples
(i.e. “fill the bottle completely”)

- Adsorption underscores the importance and requirement for isotope dilution in PFC determinations
- Minimize transfer of sample aliquots
(i.e. as much as is possible, avoid subsampling prior to addressing adsorption)
- Fill bottles completely

- Collect multiple smaller (100mL or less) bottles rather than 1-L
- Consider the addition of an organic preservative (e.g. ACN) to minimize adsorption

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