Supplementary Information for:

Evaluation of Commercial Sorbents for Separation of Ultrashort-, Short-, and Long-chain Per- and Polyfluoroalkyl Substances (PFAS) from Municipal Wastewater Effluent

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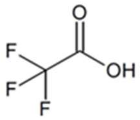
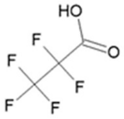
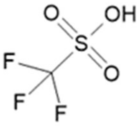
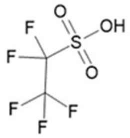
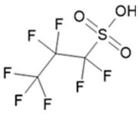
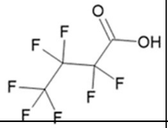
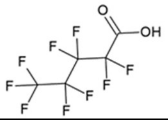
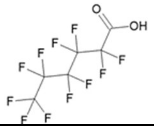
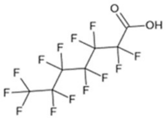
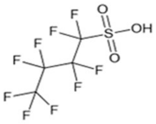
Section S.1. Chemicals and Materials

All chemicals used were certified ACS reagent grade or equivalent unless otherwise noted. Potassium bromide (KBr) for column tracer tests was obtained from Sigma Aldrich, and sodium chloride (NaCl) for electrophoretic mobility (EPM) analysis was obtained from VWR Chemicals. PFAS used in the batch and column tests are listed in **Table S.1.**

Calgon Carbon^{TM} Filtrasorb® 400 (F400) granular activated carbon (GAC) was obtained from the Calgon Carbon Corporation (Pittsburg, PA), NORIT® GAC 1240+ was acquired from NORIT/One Equity Partners (New York, NY), DEXSORB® granules were acquired from Cyclopure, (Evanston, Illinois), the surface-modified clay mineral adsorbent was acquired directly from the manufacturers pursuant to a non-disclosure agreement (NDA), Amberlite PSR2+ ion exchange (IX) resin and Amberlite IRA910 ion exchange resin were acquired from DuPont (Wilmington, DE), and Purofine PFA694 IX was acquired from Purolite (King of Prussia, PA). Relevant information provided by each of the sorbent's manufacturer are provided in **Table S.2**.

Table S.1 – 18-PFAS Mix Chemical structure, name, grouping and relevant physio-chemical properties of the 18 PFAS compounds evaluated in the study discussed in Part 2.

Structure	Acronym	Compound	CAS #	Formula	pK_a	*log K_{ow}	Grouping	Vendor
	TFA	Trifluoroacetic Acid	76-05-1	$C_2HF_3O_2$	0.3	0.91	Ultrashort-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFPrA	Perfluoropropionic Acid	422-64-0	$C_3HF_5O_2$	1.37	1.61	Ultrashort-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	TFMS	Trifluoromethanesulfonic Acid	1493-13-6	CHF_3O_3S	-15	1.15	Ultrashort-chain PFSA	Beantown Chemical (Hudson, New Hampshire)
	PFEtS	Perfluoroethanesulfonic Acid	354-88-1	$C_2HF_5O_3S$	3.31	1.23	Ultrashort-chain PFSA	Synquest Laboratories (Alachua, FL)
	PFPrS	Perfluoropropanesulfonic Acid	423-41-6	$C_3HF_7O_3S$	3.31	1.93	Ultrashort-chain PFSA	Synquest Laboratories (Alachua, FL)
	PFBA	Perfluorobutanoic Acid	375-22-4	$C_4HF_7O_2$	0,17	2.43	Short-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFPeA	Perfluoropentanoic Acid	2706-90-3	$C_5HF_9O_2$	0.4	3.4	Short-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFHxA	Perfluorohexanoic Acid	307-24-4	$C_5HF_9O_2$	0.42	4.37	Short-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFHpA	Perfluoroheptanoic Acid	375-85-9	$C_7HF_{13}O_2$	0.47	5.33	Short-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFBS	Perfluorobutanesulfonic Acid	375-73-5	$C_4HF_9O_3S$	-3.57	2.41	Short-chain PFSA	Sigma-Aldrich (St. Louis, MO)

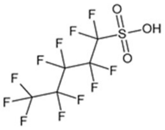
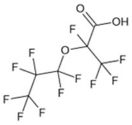
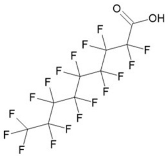
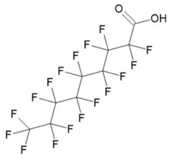
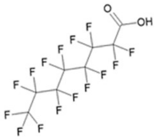
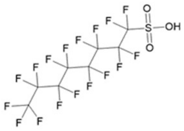
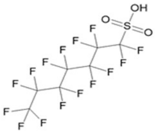
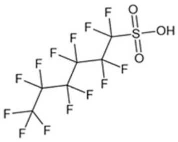
	PFPeS	Perfluoropentanesulfonic Acid	2706-91-4	$C_5HF_{11}O_3S$	-3.56	3.38	Short-chain PFSA	Biosynth AG (Gardner, MA)
	HFPO-DA	Hexafluoropropyleneoxide-dimer acid	13252-13-6	$C_6HF_{11}O_3$	2.84	3.66	Short-chain perfluoroethercarboxylic Acid (PFECA)	Matrix Scientific (Elgin, South Carolina)
	6:2 FTS	6:2 Fluorotelomersulfonic Acid	27619-97-2	$C_8H_5F_{12}O_3S$	1.31	3.85	Long-chain fluorotelomersulfonic Acid (FTSA)	AA Blocks, Inc. (San Diego, CA)
	PFNA	Perfluorononanoic Acid	375-95-1	$C_9HF_{17}O_2$	0.5	7.27	Long-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFOA	Perfluorooctanoic Acid	335-67-1	$C_8HF_{15}O_2$	-0.5 to 4.2	6.3	Long-chain PFCA	Sigma-Aldrich (St. Louis, MO)
	PFOS	Perfluorooctanesulfonic Acid	1763-23-1	$C_8HF_{17}O_3S$	< -1.0	-1.08	Long-chain PFSA	Matrix Scientific (Elgin, SC)
	PFHpS	Perfluoroheptanesulfonic Acid	375-92-8	$C_7HF_{15}O_3S$	-3.29	5.31	Long-chain PFSA	Cayman Chemical Co. (Ann Arbor, MI)
	PFHxS	Perfluorohexanesulfonic Acid	355-46-4	$C_6HF_{13}O_3S$	0.14	4.34	Long-chain PFSA	Sigma-Aldrich (St. Louis, MO)

Table S.2A Sorbent Information

Type	Name	Manufacturer	PFAS-selective	Porosity	Functional Group	Reported Capacity *	Resin Type	Base Material / Polymer Composition
GACs	Calgon F400 GAC	Calgon	No		-	-	-	Coal
	Norit 1240+ GAC	Norit	No		-	-	-	Coal
Alternative Adsorbents	DEXSORB	Cyclopure	Yes	Porous Polymer	-	-	-	Beta-Cyclodextrin (quaternized), tetrafluoronitrile (TFN) crosslinked
	MOD-CLAY	Annonymous	Yes		-	-	-	Montmorillonite Clay
IX Resins	PFA694 IX	Purolite	Yes	Microporous Gel	proprietary "complex amino"	1.0 eq/L (PFA694E)	strong base, "other"	polystyrene, divinylbenzene crosslinked (PS-DVB)
	PSR2+ IX	Amberlite	Yes	Microporous Gel	tributylamine	> 0.7 eq/L	strong base, Type I	(PS-DVB)
	IRA910 IX	Amberlite	No	Macroporous	dimethylethanol ammonium	1.0 eq/L	strong base, Type II	(PS-DVB)

*Typcilly refers to equivalent Cl- exchange as listed by manufacturers per data specification sheets (Boyer, Ellis 2025)

Table S.2B Sorbent Characteristics

Name	reported particle size		S_BET	S_BET_ micro	S_meso	W_total	W_micro	W_meso	pH_ PZC	Zeta Pot. (mV)	source
	US Mesh	micron	m2/g	m2/g	m2/g	ml/g	ml/g	ml/g			
Calgon F400 GAC	# 30 - 20	550 - 750	769	617	143	0.41	0.33	0.08	9.95		Park 2020
			~900				0.32			-7.5	Wu 2020
			824			0.2			7.1		Zeng 2021
			827			0.56	0.041	0.148			Zhang 2025
Norit 1240+ GAC	# 40 - 10	425 - 2000	972		125		0.37		9.7	-	Coelho et al. 2006
DEXSORB	# 70 - 35	212 - 500	19							6.5	Wu,2020
			19							~17	Gorji Ching 2020
MOD-CLAY	# 45 - 20	360 - 850	~100			0.1					Zhang 2025
		573									Yan 2020
PFA694 IX	# 30 - 25	600 -750									
PSR2+ IX	# 30 - 25	650 - 750								13	Lin 2023
IRA910 IX	# 35 - 20	530 - 800									

S_BET = BET surface area (_micro = micropore surface area; _meso = mesopore surface area)

W = pore volume (_total = total pore volume; _micro = micropore volume; _meso = mesopore volume)

Zeta Potential is reported at circumneutral pH

Table S.3. Synthetic wastewater composition. Table 2.2 presents the composition of the synthetic wastewater matrix (SW water matrix) used in the batch adsorption capacity and kinetics tests.

Synthetic Wastewater (SWW)		
component	concentration	units
TSS	0.0	mg/L
TDS**	268.3	mg/L
Dissolved EfOM (as C)	5.32	mg/L
pH	8.6	
Na+	59.0	mg/L
Ca2+	26.0	mg/L
Mg2+	3.2	mg/L
Cl-	99.9	mg/L
NO3-	10.1	mg/L
HPO42-	0.4	mg/L
HCO3-	69.8	mg/L

**TDS is sum of listed inorganic ions

Table S.4. Relevant Parameters for the RSSCTs. Columns were packed with 1% active media mass, and initial PFAS concentration was targeted to be 10 µg/L. The average influent concentration of each of the artificially-spiked PFAS is presented in the Supplemental Information **Table #S.xx**. All media was used as received, except F400 was ground a sieved to the specified size in Table 4 because of the large degree of heterogeneity in the F400 particle size.

RSSCT Parameters						
parameter	unit	Sand Control	F400 GAC	DEXSORB	PFA694 IX	IRA910 IX
Specific Gravity	-	~2.6	0.57	1.1	1.05	1.09
particle size	US Mesh	# 50 - 30	# 50 - 30	# 70 - 35	# 30 - 25	# 35 - 20
	micron	297-595	297-595	212-500	600-750	530-800
effective particle size	micron	450	450	356	675	665
Media Wall Effects Ratio	-	48.7	46.5	58.8	31.5	31.0
[Particle Radius Ratio (small-scale : large-scale)] ^ 2	-	1	0.48	1	1	1
Pore Volume	mL	37.0	44.6	50.4	38.9	42.4
Mins/PV	mins	32.7	39.5	44.6	34.4	37.5
Large-Scale EBCT	mins	27.3	56.9	27.3	27.3	27.3
Small-Scale EBCT	mins	27.3				
*effective Small-Scale EBCT***	mins	-	0.8	0.4	0.5	0.4
Column Length	cm	9.0				
Inner Diameter	cm	2.09				
Flow Rate	ml/min	1.13				
HLR	cm / min	0.33				
	m / h	0.20				
Mass Active Media - Replicate 1	mg	0	481.3	479.6	480.4	479.8
Mass Active Media - Replicate 2	mg	0	479.9	479.6	479.8	481.0

**effective EBCT = active media volume / flow rate

Table S.5. Characteristics of the tertiary UF membrane-treated municipal wastewater effluent (previously disinfected) used as the influent to packed-bed test columns in the RSSCTs. The 18-PFAS analytes were spiked into 55-L polypropylene reservoirs. Reservoirs were allowed to mix gently for at least one hour prior to inserting the column influent lines into the bottom of the reservoir.

RSSCT Influent Characterization								
Res AB - 7/8 6 pm - 7/11 10 pm			Res CD - 7/11 10 pm - 7/15 Noon			Res EF - 7/15 Noon - 7/18 10 pm		
component	concentration	units	component	concentration	units	component	concentration	units
TSS	0.0	mg/L	TSS	0	mg/L	TSS	0	mg/L
TDS	368	mg/L	TDS	363	mg/L	TDS	377	mg/L
DOC	10.2	mg/L	DOC	10.4	mg/L	DOC	10.5	mg/L
pH	8.0		pH	7.9		pH	7.9	
NH4+	62	mg/L	NH4+	62	mg/L	NH4+	56	mg/L
Na+	80		Na+	82		Na+	82	
Ca2+	20.2	mg/L	Ca2+	20.4	mg/L	Ca2+	20.2	mg/L
Mg2+	11.8	mg/L	Mg2+	11.8	mg/L	Mg2+	11.6	mg/L
Cl-	116	mg/L	Cl-	110	mg/L	Cl-	120	mg/L
NO3-	0.4	mg/L	NO3-	0.2	mg/L	NO3-	0.2	mg/L
PO4-	13.6	mg/L	PO4-	13.6	mg/L	PO4-	12.0	mg/L
SO43-	33.0	mg/L	SO43-	33.6	mg//L	SO43-	30.6	mg/L
Al3+	ND		Al3+	ND		Al3+	ND	
Total Fe	124.5	µg/L	Total Fe	124.7	µg/L	Total Fe	139.8	µg/L
Pb 2+	<0.1	µg/L	Pb 2+	<0.1	µg/L	Pb 2+	<0.1	µg/L

Section S.1. Batch Test Procedural Details

All tests were performed in triplicate for statistical analysis. Control samples were treated as the initial PFAS concentration (c_0) for purposes of determining adsorption capacities, and kinetic rates. While for the SW matrix batch tests the average concentration of the SW matrix control samples were treated as the PFAS initial concentration (c_0) to account for any PFAS sorption to dissolved EfOM. For all batch tests PFAS were spiked from a dilute aqueous 100 µg/L or concentrated methanolic 18-PFAS mix stock solution (1 mg/L or 200 mg/L of each PFAS) to the nominal initial concentration for each batch test, while maintaining residual methanol concentration of less than 1% v/v. Samples for the batch kinetics tests were collected from sacrificial samples at each time step: after 1 minute, 5 minutes, 10 minutes, 20 minutes, 1 hour, 2 hours, 6 hours, 1 day, and 4 days of equilibration time.

The adsorption isotherms conducted in ultrapure water shown in **Figure 2.1** portray the total PFAS mass adsorbed onto each of the seven evaluated sorbent media as a function of the residual aqueous PFAS concentration after 4 days of equilibration. Individual PFAS analyte isotherm plots, and multi-component isotherms separated by PFCAs and PFSAs for each of the seven sorbents are given in **Figures S.10-S.16,** and **Tables S.9-S.15**.

Similar percent removals of PFAS were achieved for each sorbent in the UP water matrix with nominal initial PFAS concentrations of 50 µg PFAS/L, and 110 µg PFAS/L. Therefore, the comparison between the 10 µg PFAS/L initial concentration for the U matrix condition is an acceptable comparison for the 20 µg PFAS/L initial concentration batch sorption test conducted in the SW matrix (**Figure S.5**). Negative values for the percent removal of short- and ultrashort-chain PFAS were observed in the SW matrix due to a high degree of competitive adsorption from either the high PFAS concentrations; or, from SW matrix interferences impacting the accuracy of the LC-MS/MS quantitation of the control sample concentration.

Section S.2. Sorbent Characterization - Point of Zero Charge

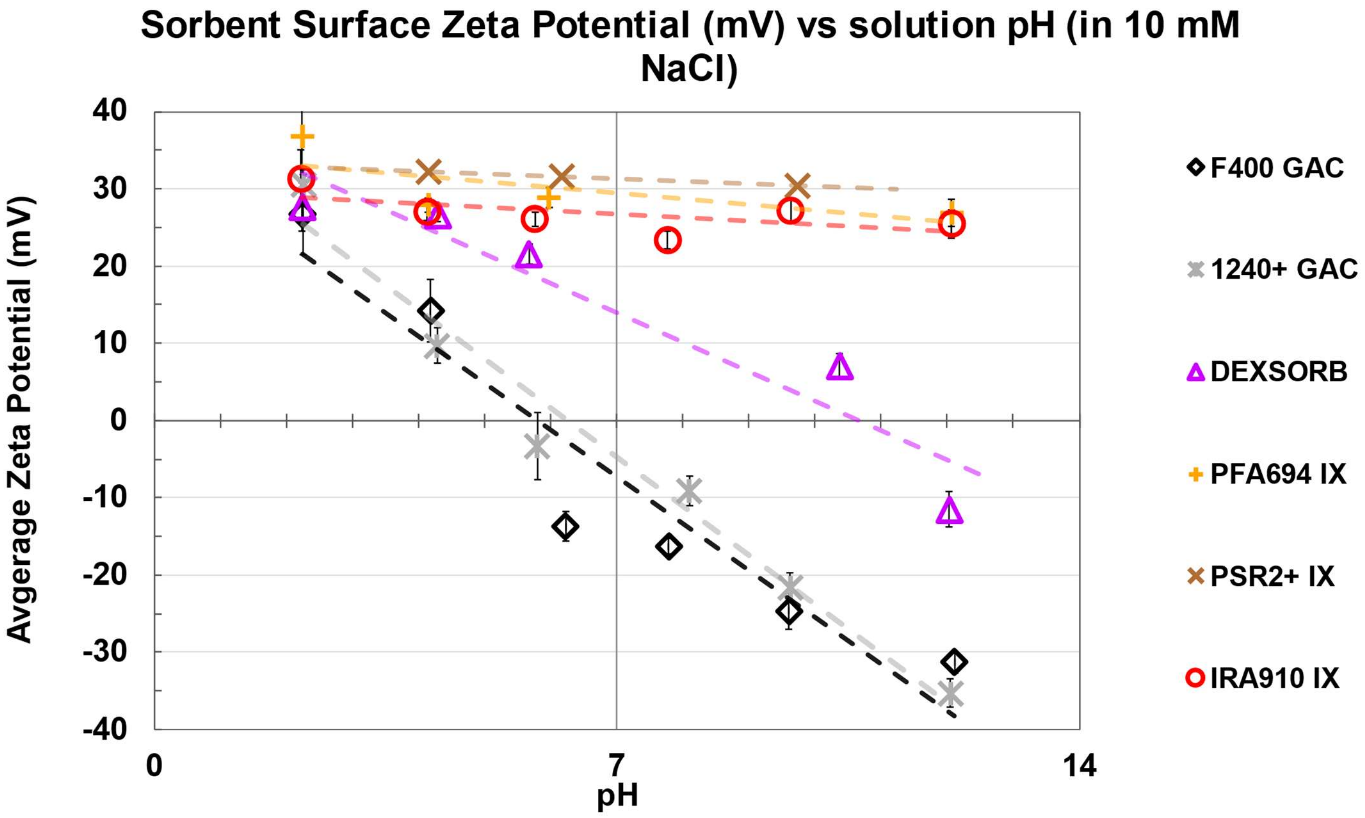
Surface zeta potentials for the evaluated media were measured with a Zetasizer Nano ZS (Malvern Instruments, UK)) across a broad range of solution pH values to characterize each media's point of zero charge (PZC). Briefly, each of the sorbents was pulverized to a fine powder using a mortar and pestle. The crushed sorbent was added at a concentration of 500 mg/L to a pH adjusted 10 mM NaCl solution at one of pH 2, 4, 6, 8, 10, or 12. The solution pH was measured with a Thermo Scientific (Waltham, MA) Orion^{TM} Star A111 pH meter and re-adjusted to the target pH using either concentrated HCl or NaOH. Once a stable pH reading was observed, the surface zeta potential was measured using the Zetasizer Nano ZS. Determination of the surface zeta potential over a range of pH values allowed for the determination of the PZC for each sorbent. All experimental procedures for determination of the PZC were conducted in triplicate. The results of the PZC determination are presented in **Figure S.1**, and the data for each sorbent is presented in **Table S.3**.

The commercial modified-clay mineral adsorbent media was not characterized for its PZC due to irreproducible zeta potential data and drifting pH measurements when preparing the 10 mM NaCl and ground sorbent solution. This effect is possibly due to mechanical abrasion and crushing caused by the mortar and pestle, which may have weakened the surfactant's binding to the clay surface. Another potential explanation might be that the surfactant leached from the mineral surface at acidic pH.

Table S.6. Summary of the results of the PZC determination experiments.

Sorbent	Temp (C)	pH	std dev of pH	Average Zeta Potential (mV)	Average Standard Deviation of Zeta Potential Over 3 Replicates
F400 GAC	21.9	2.24	0.01	26.7	5.2
	21.2	4.19	0.11	14.2	4.1
	21.4	6.23	0.04	-13.7	1.8
	21.2	7.79	0.12	-16.3	1.0
	21.4	9.60	0.10	-24.7	2.3
	21.1	12.11	0.01	-31.3	1.4
1240+ GAC	21.0	2.25	0.01	30.6	2.0
	21.2	4.28	0.05	9.7	2.2
	21.6	5.80	0.03	-3.3	4.4
	21.6	8.10	0.21	-9.1	1.9
	22.0	9.63	0.04	-21.6	1.9
	22.0	12.05	0.02	-35.3	1.9
DEXSORB	22.0	2.24	0.01	27.7	3.1
	22.6	4.29	0.01	26.6	0.9
	24.6	5.67	0.06	21.6	1.3
	-	-	-	-	-
	24.7	10.38	0.10	7.0	1.6
	22.2	12.03	0.01	-11.5	2.2
PSR2+ IX	24.3	6.16	0.07	31.6	1.9
	23.2	4.16	0.01	32.2	1.5
	22.5	9.73	0.02	30.4	1.0
	-	-	-	-	-
	-	-	-	-	-
	-	-	-	-	-
IRA910 IX	23.5	2.22	0.01	31.4	3.7
	23.8	4.13	0.02	27.0	1.1
	23.1	5.76	0.08	26.1	1.0
	23.3	7.77	0.04	23.4	1.1
	22.0	9.63	0.03	27.1	1.5
	21.5	12.07	0.03	25.5	1.8
PFA694 IX	20.2	2.24	0.04	36.9	6.7
	19.6	4.15	0.00	27.9	0.9
	21.6	5.98	0.06	28.9	1.3
	22.2	12.07	0.02	26.9	1.8
	-	-	-	-	-
	-	-	-	-	-

Figure S.1. Surface zeta potential measurements collected for six of the seven adsorbents evaluated in this study. Zeta potential measurements (mV) were collected in triplicate experiments using a Zetasizer Nano ZS (Malvern Scientific) by first pulverizing the sorbent to a fine powder using a mortar and pestle, suspending 500 mg/L of sorbent in a pH adjusted 10 mM NaCl aqueous solution, re-adjusting the pH to a stable concentration using concentrated NaOH or HCl solutions, then operating sorbent specific standard operating procedures (SOP) for the electrophoretic mobility analyses caried out within the folded capillary cell (Malvern product number: DTS1070). The PZC determination tests were not completed for the modified clay due to procedural difficulties and inconsistent results potentially due to surfactant leeching from the modified-clay mineral surface leading to alteration of the media and test solution composition.



Section S.3. Liquid Chromatography – Tandem Mass Spectrometry (LC-MS/MS) Analytical Methodology

The LC was operated with a dual component mobile phase of 5 mM ammonium formate in HPLC grade water, with 0.1 % v/v formic acid (phase A) and 100% HPLC grade acetonitrile (phase B). Details of the LC gradient program are given in **Table S.2.** The MS/MS operation mode was set to negative electrospray ionization (ESI-). **Table S.3** details the multiple reaction monitoring (MRM) transitions and operational parameters for each PFAS and mass-labelled internal standards. Mass labeled $^{13}C_4$-PFOS (mPFOS), $^{13}C_4$-PFOA (mPFOA), and $^{13}C_4$-PFBA (mPFBA) mPFHxS, mPFNA, mHFPO-DA, m6:2-FTS, mPFBA were used as internal standards for quantification of PFAS. All liquid chemicals used in LC-MS/MS analysis of PFAS were Optima® LCMS Grade, and ammonium formate was certified Optima® LCMS Grade. Chemicals used in the LC-MS/MS analysis of PFAS were purchased from Fisher Chemical.

All samples and calibration standards prepared for the LC-MS/MS analysis of PFAS were prepared in polypropylene vials purchased from Thermo Fisher Scientific, Agilent Technologies, or Waters and polypropylene caps with polypropylene/silicone septa certified for use in PFAS applications (purchased from Agilent (Santa Clara, CA; product no. 5191-8151). Calibration standards and samples were prepared with 60:40 volumetric ratio of methanol to water for to minimize the loss of PFAS to the LC-MS vials. A 10- to 12-point calibration curve was prepared for each batch of LC-MS/MS analyses which ranged from 0.02 to 15 μg/L of each PFAS. Samples were diluted to fit within the range of calibration standards. Quantified PFAS concentrations were determined using the isotope dilution method (EPA Method 1633). The method limit of detection (LOD) was determined for each compound by dividing the standard deviation of the intercept by the slope of the linear expression generated from analysis of the calibration standards and multiplying this quotient by a factor of 3.3. The method limit of quantitation (LOQ) was determined by multiplying the same quotient by a factor of 10.

Table S.7 LC gradient program for elution of PFAS using 5 mM ammonium formate in water (0.1% formic acid) (phase A) and 100% Acetonitrile (phase B)

time (min)	%A (5 mM ammonium formate with 0.1% formic acid)	%B (100% Acetonitrile)	flow rate (mL/min)
0.00	80	20	0.30
3.00	35	65	0.30
6.50	20	80	0.30
10.00	3	97	0.30
11.50	3	97	0.30
11.51	80	20	0.30
16.00	80	20	0.30

Table S.8. LC-MS/MS parameters used for quantification of PFOS and caffeine.

Acronym	Internal Standard ?	Parent Ion (m/z)	Product Ion (m/z)	Cone (V)	Collision Energy (eV)	Retention Time (mins)
TFA	N	112.70	68.4	19	10	3.9
TFMS	N	148.95	79.4	22	20	5.5
PFEtS	N	198.50	79.4	30	20	6.8
PFBA	N	213.00	169.00	11	13	7.0
mPFBA	Y	217.00	172.00	11	13	
PFPrA	N	163.00	118.60	17	10	6.0
PFPrS	N	249.10	79.4	27	25	7.2
PFBS	N	299.00	79.40	20	35	7.8
	N	299.00	98.50	25	35	
PFPeA	N	263.10	68.50	17	20	7.9
	N	263.10	219.00	17	8	
HFPO-DA	N	285.10	169.00	17	7	8.5
		329.10	169.00	11	14	
mHFPO-DA	Y	287.10	169.00	17	7	
PFHxA	N	313.10	118.60	18	22	8.7
	N	313.10	269.10	18	9	
mPFHxA	Y	315.00	270.00	18	13	
PFPeS	N	348.95	79.40	54	40	8.4
	N	348.95	98.50	54	35	
PFHpA	N	363.10	168.90	17	18	9.6
	N	363.10	319.00	18	10	
PFHxS	N	399.00	79.40	54	35	8.9
	N	399.00	98.50	54	35	
mPFHxS	Y	403.00	103.00	65	35	
PFOA	N	413.10	169.00	18	19	10.2
	N	413.10	369.05	18	10	
mPFOA	Y	417.10	372.00	18	10	
6-2 FtS	N	427.00	79.40	47	35	10.4
	N	427.00	407.00	47	19	
m6-2 FtS	N	429.00	409.00	47	19	
	N	429.00	81.00	47	35	
PFHpS	N	449.00	79.40	34	35	9.5
	N	449.00	98.50	34	35	
PFNA	N	463.00	219.00	18	11	11.1
	N	463.00	419.00	18	13	
mPFNA	Y	468.00	423.00	18	13	
PFOS	N	498.95	79.40	53	40	10.1

Section S.4. Effluent Organic Matter (EfOM) Isolate Preparation and Synthetic Wastewater Preparation

An EfOM isolate was prepared by solid phase extraction (SPE) of a 10-gallon sample of secondary effluent water, prior to disinfection, from King County's West Point Wastewater Treatment Plant in January 2025. The two 5-gallon jerricans used for sample collection were rinsed three times with deionized water and then two times with sample water prior to collection. Shortly after collection, samples were transported to the University of Washington in a cooler on ice, covered from sunlight and stored at 4 C until use. DOC and UV absorbance spectra from 200 to 700 nm were collected on the filtered sample. The initial DOC was 10.9 mg-C L^{-1} and UV_{254} was 0.1682 abs cm^{-1}. The samples were then acidified to pH ~2 by incremental addition of 113 mL of 1 M sulfuric acid was added for a final concentration of 1.5 mM.

BondElute^{TM} PPL cartridges (6 mL, 1 gram, Agilent), consisting of a styrene-divinylbenzene (SDVB) polymer, were used as the solid phase in the organic matter extraction procedure. Each cartridge was first attached to the SPE-manifold and were pre-conditioned by rinsing two cartridge volumes with LC/MS grade methanol (Fisher Scientific) via gravity flow for the first three minutes, then intermittent suction was applied by a vacuum pump to a pressure of –1 in Hg. One cartridge volume of ultrapure Milli-Q water was then passed through the cartridge at the same rate. Then, filtered and acidified secondary effluent sample was processed through the SPE cartridges at a vacuum pressure of –1 in Hg, which produced a flow rate of approximately one drop per second.

As indicated by monitoring of the UV_{254} absorbance of aliquots of the effluent sample passed through the SPE cartridges - once approximately 50% breakthrough of the effluent organic matter was detected in the SPE effluent, the cartridges were replaced until all of the filtered sample had been processed through the SPE-manifold. The SPE cartridges were then rinsed with 15 mL of 0.01 M sulfuric acid, dried by pulling vacuum through the cartridge for 15 minutes until visibly dry, and then eluted with two cartridge volumes of methanol via gravity flow for two minutes and then intermittent vacuum pupping at a pressure of –1 in Hg into previously baked (400 C) conical glass ampules.

Twenty conical glass ampules containing isolate from each cartridge were then dried under nitrogen (N-EVAPTM Nitrogen Evaporation System, Organomation; Berlin, MA) until approximately 10% remained in the ampule. The 20 individual extracts were then combined into two separate ampules, including rinsing of the ampule side walls two times with LC/MS grade methanol. The two ampules containing combined extracts were then dried with the NEVAP until no observable liquid was present. The final EfOM extract was a brown semi-solid as depicted in the representative photograph in **Figure S.2**. The combined extracts were stored in the dark at 4 C in a desiccator to remove residual moisture. A total of 412.6 mg-C was in the original sample and 357 mg-C was recovered during solid phase extraction (86%).

Figure S.2. Representative photographs of the final effluent organic matter (EfOM) isolate.

EfOM stock solutions were prepared from the combined EfOM isolate by adding a known mass of isolate to the unbuffered ultrapure water and dissolving by continuous mixing on a stir plate overnight, after incrementally adding NaOH to adjust the pH to 10. The concentration of dissolved organic carbon (DOC) in the prepared stock solutions was quantified using a Shimadzu TOC-L analyzer (Kyoto, Japan) as described in **Section S5** below.

The synthetic wastewater used in batch adsorption capacity and kinetics tests was prepared to mimic the characteristics of a typical wastewater treatment plant effluent by combining EfOM stock solutions (prepared as described above) with stock solutions of typically occurring inorganic ions.[1–3] Briefly, calcium chloride ($CaCl_2$), calcium nitrate ($Ca(NO_3)_2$), magnesium chloride ($MgCl_2$), magnesium nitrate ($Mg(NO_3)_2$) were combined in ultrapure water as a "divalent cation and nitrate" stock; while sodium chloride (NaCl), sodium bicarbonate ($NaHCO_3$), and sodium phosphate dibasic ($Na_2(PO_4)$) were combined in ultrapure water as a "sodium, bicarbonate, and phosphate" stock. In the batch tests, 5 mg of sorbent was placed into the 50 mL polypropylene (PP) tube, then the tube was filled to an appropriate volume with ultrapure water, then each of the inorganic ion stocks, then the EfOM stock, and finally spiked to the approximate initial target concentration of PFAS with a concentrated methanolic stock of the 18-PFAS mixed system.

Section S.5. Wastewater Sampling and Characterization

Wastewater treatment plant (WWTP) effluent was obtained from the West Point Treatment Plant located in Seattle, WA and operated by the King County Wastewater Treatment Division from a pilot system operating a tertiary ultrafiltration membrane fed from disinfected secondary effluent. Details of the UF membrane pilot are presented in the main text. Samples were collected on 7/7/25 and 7/14/25 in HDPE 5-gal buckets or carboys with fitted lids and stored, as soon as possible after collection, in a refrigerator 4 C until use.

For sample collection, 5-gallon HDPE jerricans were pre-rinsed three times with deionized water, and field-rinsed with sample water two times prior to collecting the wastewater sample. Samples were transported in chilled coolers to storage at 4 °C until processed via solid-phase extraction manifold to generate a solid-phase organic matter isolate. The isolate was then re-constituted in an aqueous solution for use in batch adsorption capacity and kinetics tests.

The collected wastewater samples were added to a 55-L LDPE drum and spiked with a methanolic stock of 18-PFAS to the approximate target concentration of 10 μg/L of each PFAS on three separate occasions. The first 55-L drum, denoted as Reservoir AB operated as the influent reservoir to the packed-bed test columns from 7/8/25 at 6:00 pm until 7/11/25 at 10:00 pm, the second reservoir (CD) operated from 7/11 10:00 pm to 7/15 12:00 pm, and the third reservoir (EF) operated from 7/15 12:00 pm until 7/18 at 10:00pm, which corresponds to the end of the RSSCTs.

Aliquots of reservoir feed were collected prior to the addition of PFAS, and after allowing the reservoir to be gently mixed for at least one hour. Each of the aliquots was characterized as follows to gain a better understanding of the chemical composition of the UF membrane tertiary-treated wastewater effluent. Dissolved organic carbon (DOC) was quantified using a Shimadzu TOC-L analyzer (Kyoto, Japan) using the non-purgeable organic carbon analysis mode; procedures for measuring DOC were as follows. A 20 mL sample of wastewater effluent was filtered through a 0.45-micron cellulose acetate syringe filter by first priming the filter with 5 mL of DI water, wasting approximately 20 mL of sample through the filter, prior to collecting a 9 mL aliquot for DOC analysis. Total dissolved solids (TDS) and total suspended solids (TSS) were quantified as follows. A Whatman glass fiber filter was pre-washed with 60 mL of ultrapure water, dried at 100 °C overnight, weighed, and washed with an additional 30 mL of ultrapure water. A 250 mL glass beaker was also washed with ultrapure water, dried at 180 °C overnight and weighed. A 250 mL aliquot of WWTP effluent sample was passed through this filter using high vacuum, and the filtrate was collected in the 250 mL beaker. Filtrate was evaporated to dryness at 100 °C and weighed once cool.

The difference in mass compared to the washed beaker was attributed to TDS. Organics retained on the filter were dried at 100 °C overnight and weighed, none of the three RSSCT reservoir aliquots retained any measurable TSS on the GF filters. Sample pH was measured with an Orion Star A111 pH meter equipped with an Orion Ross Ultra pH/ATC Triode probe.

Quantification of ions from common salts were measured via ion chromatography (for anions: chloride, nitrate, and sulfate) and inductively coupled plasma mass spectrometry [ICP-MS; for cations: sodium, calcium(II), magnesium(II), lead(II), aluminum(III), and total iron]. Samples were filtered with a 0.45 micron cellulose acetate syringe filter, after priming and wasting as described above prior to collecting an aliquot for IC and ICP-MS analysis. ICP-MS samples were also acidified with nitric acid to obtain a final acid concentration of 1% v/v.

No quantifiable amounts of PFAS were found in the wastewater effluent samples. Wastewater sample characterization results are presented in the main text**.**

Section S.6. BATCH TEST MODEL CALCULATIONS

S6.1 Kinetics Model Calculations

Three models were employed to evaluate the kinetic PFAS adsorption data for the Calgon F400 GAC, DEXSORB, Surface-Modified Clay, PFA694 IX resin, and IRA910 IX resin. The first two equations are linear fits of the pseudo first order (PFO) and pseudo second order (PSO) kinetic models, commonly used to describe adsorption kinetics for a range of adsorbent materials and contaminants[4,5]. Pseudo-alpha-order reactions are those that depend on the concentrations of multiple reactants but are practically assumed to depend on the concentration of only one reactant (e.g., PFOS) because the others are present in excess. The equations for these models are as follows: [6]

$$\frac{dq_t}{dt} = k_1(q_e - q_t) \qquad \text{Eq. (A.1)}$$

$$\ln(q_e - q_t) = \ln(q_e) - k_1 t \qquad \text{Eq. (A.2)}$$

$$\frac{dq_t}{dt} = k_2(q_e - q_t)^2 \qquad \text{Eq. (A.3)}$$

$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e} \qquad \text{Eq. (A.4)}$$

where q_t and q_e are the PFAS adsorption density at time t and at equilibrium in µg PFAS/mg sorbent material; t is time in hours; and k_1 and k_2 are the PFO and PSO kinetic rate constants, with units of hour^{-1} and (mg sorbent) (µg PFAS)$^{-1}$ (hour)$^{-1}$.

$$\frac{dq_t}{dt} = k_1(q_e - q_t) \qquad (5)$$

$$\ln(q_e - q_t) = \ln(q_e) - k_1 t \qquad (6)$$

$$\frac{dq_t}{dt} = k_2(q_e - q_t)^2 \qquad (7)$$

$$\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e} \qquad (8)$$

where q_t and q_e are the PFAS adsorption density at time t and at equilibrium in µg PFAS / mg sorbent; t is time in hours; and k_1 and k_2 are the PFO and PSO kinetic rate constants.

For the linear PFO model, a graph of the natural log of ($q_e - q_t$) was plotted as a function of time, and the equilibrium adsorption capacity (q_e) was evaluated as the adsorption capacity at four days to calculate the y-variables. The rate constant (k_1) and equilibrium adsorption capacity (q_e) were then determined using Eq. (A.2) and the slope and intercept of this graph. For the linear PSO model, a graph of t/q_t versus time was plotted, and the rate constant (k_1) and equilibrium adsorption capacity (q_e) were then solved using Eq. (A.4) and the slope and intercept of this graph.

Each of the PFO and PSO models were also solved via non-linear regression utilizing the Solver function in MS Excel®. In general, the non-linear regression models provided a better fit to the observed data than did the linearized versions of the models.

S6.2. Adsorption Isotherm Model Calculations

Adsorption isotherm data for all seven of the evaluated commercial adsorbent media were fit to both the Langmuir and Freundlich adsorption isotherm models whose original and linear forms are given below as Eq. (A.10) through Eq. (A.13)(Crittenden et al., 2012):

$$q_e = \frac{q_{max} K_L C_e}{1 + K_L C_e} \qquad \text{Eq. (A.5)}$$

$$\frac{C_e}{q_e} = \frac{1}{q_{max}} C_e + \frac{1}{K_L q_{max}} \qquad \text{Eq. (A.6)}$$

$$q_e = K_F C_e^{1/n} \qquad \text{Eq. (A.7)}$$

$$\log(q_e) = \frac{1}{n}\log(C_e) + \log(K_F) \qquad \text{Eq. (A.8)}$$

where q_e and q_{max} were the equilibrium and maximum adsorption densities, C_e is the equilibrium adsorbate concentration, K_L and K_F are the Langmuir and Freundlich adsorption rate constants, respectively, and $1/n$ is the Freundlich coefficient of non-linearity.

$$q_e = \frac{q_{max} K_L C_e}{1 + K_L C_e} \qquad (1)$$

$$\frac{C_e}{q_e} = \frac{1}{q_{max}} C_e + \frac{1}{K_L q_{max}} \tag{2}$$

$$q_e = K_F C_e^{1/n} \tag{3}$$

$$\log(q_e) = \frac{1}{n}\log(C_e) + \log(K_F) \tag{4}$$

where q_e and q_{max} were the equilibrium and maximum adsorption densities in μg PFAS / mg sorbent, C_e is the equilibrium adsorbate concentration in μg PFAS / L ultrapure water , K_L (L / μg PFAS) and K_F ((μg PFAS / mg sorbent) * (L / μg)^(1/n) are the Langmuir and Freundlich adsorption rate constants, respectively, and *1/n* is the Freundlich coefficient of non-linearity.

For both models, experimental data was transformed to the appropriate linear variables shown in Eq. (A.11) and (A.13) and plotted to obtain linear isotherm values for the model parameters (q_{max} and K_L for the Langmuir model and K_F and *1/n* for the Freundlich model) from the slope and intercept of the plotted data. Non-linear isotherm values for the model parameters were also obtained through minimization of the square error between experimentally and theoretically derived equilibrium adsorption densities (q_e) using the Microsoft Excel® solver function. Theoretical values for q_e were obtained using Eq. (A.10) and (A.12) with the linearly derived isotherm values as starting points. In all cases the non-linear model parameters provided a better fit for the data and were used for all further analysis and discussion.

Section S.7. Rapid Small-Scale Column Tests (RSSCTs)

S7.1 Tracer Tests

Following column assembly, a tracer test was performed using potassium bromide to determine the pore volume of each of the test media columns. Tracer stock solutions of 500mM, 200 mM and 50 mM Br- as KBr were prepared in ultrapure water. The various concentration stocks were used for account for the moderate levels of bromide adsorption by the test media. **Figure**

S.5A-S.5E depict representative tracer test plots for the sand control and each test media column.. The different values on the vertical axis are shown to be measuring different orders of magnitude bromide effluent, based on the tracer stock solution used for the test. It is unclear the impacts that positively charged sorbents such as DEXSORB and the ion exchange resins may have on the sorption of bromide ions in these types of tracer tests, but results should be independent of the actual closure of the tracer test mass balance for the test column influent and effluent.

The pore volume of each sorbent pair was used to normalize for variations in the total volume of water treated by any of the test columns. The bromide concentrations were determined using a a calibrated bromide ion selective electrode (ISE) with an Orion Versa Star pH/ISE Measurement Module equipped with a temperature probe. Various concentrations of the potassium bromide tracer were used as the source of the “conservative” Br- tracer “plug” that was tracked in column effluent during the tracer tests, thus the tracer test plots in **Figure S.17** are shown to be measuring different orders of magnitude Br- in the effluent. It is unclear the impacts the positively charged sorbents such as DEXSORB® and the IX resins may have on the sorption of bromide ions in these types of tracer tests, but results should be independent of the actual detection of the tracer test mass balance before and after the test column. Samples from the RSSCT experiment were collected from 3-way polycarbonate medical-grade stopcocks located at the top of the columns operating in an upflow configuration. Sample ports were allowed to purge for at least three minutes prior to collecting approximately 1 mL of sample at approximately 1.13 mL / min flow rate through each column.

To conduct the tracer tests, a flow of 1 mL/min of deionized (DI) water was started through the first column replicate of each adsorbent type (for a total of five columns). The columns were allowed to equilibrate for at least 30 minutes at the correct flow rate and, once equilibrated, influent lines were removed from the DI water, placed in the appropriate KBr stock for approximately 3 seconds, and then placed back in the DI water before the intake portion of the tubing that was submerged in the KBr stock was quickly rinsed with a squirt bottle of DI water, to prevent residual bromide from contaminating the DI stock solution. Small air bubbles were allowed to form in the tubing lines on either side of the KBr stock to track the location of the tracer. The movement of the tracer aliquot through the influent lines to the start of the column was timed and recorded for future reference. Tracer test sampling started once the tracer stock reached the column with 0.5 minute samples collected every two to four minutes from each column. Collected samples were weighed, amended with 5 Molar sodium nitrate "Ionic Strength Adjuster" (ISA), diluted to 15 or 30 mL to allow for enough sample volume to detect a bromide concentration utilizing a calibrated bromide ion selective electrode (ISE) equipped with a temperature probe. Column parameters are given in **Table 2.3,** and the column influent characterization is presented in **Table 2.4**, both of which are included in the main text.

Figure S.3 Pictures of the RSSCT setup.

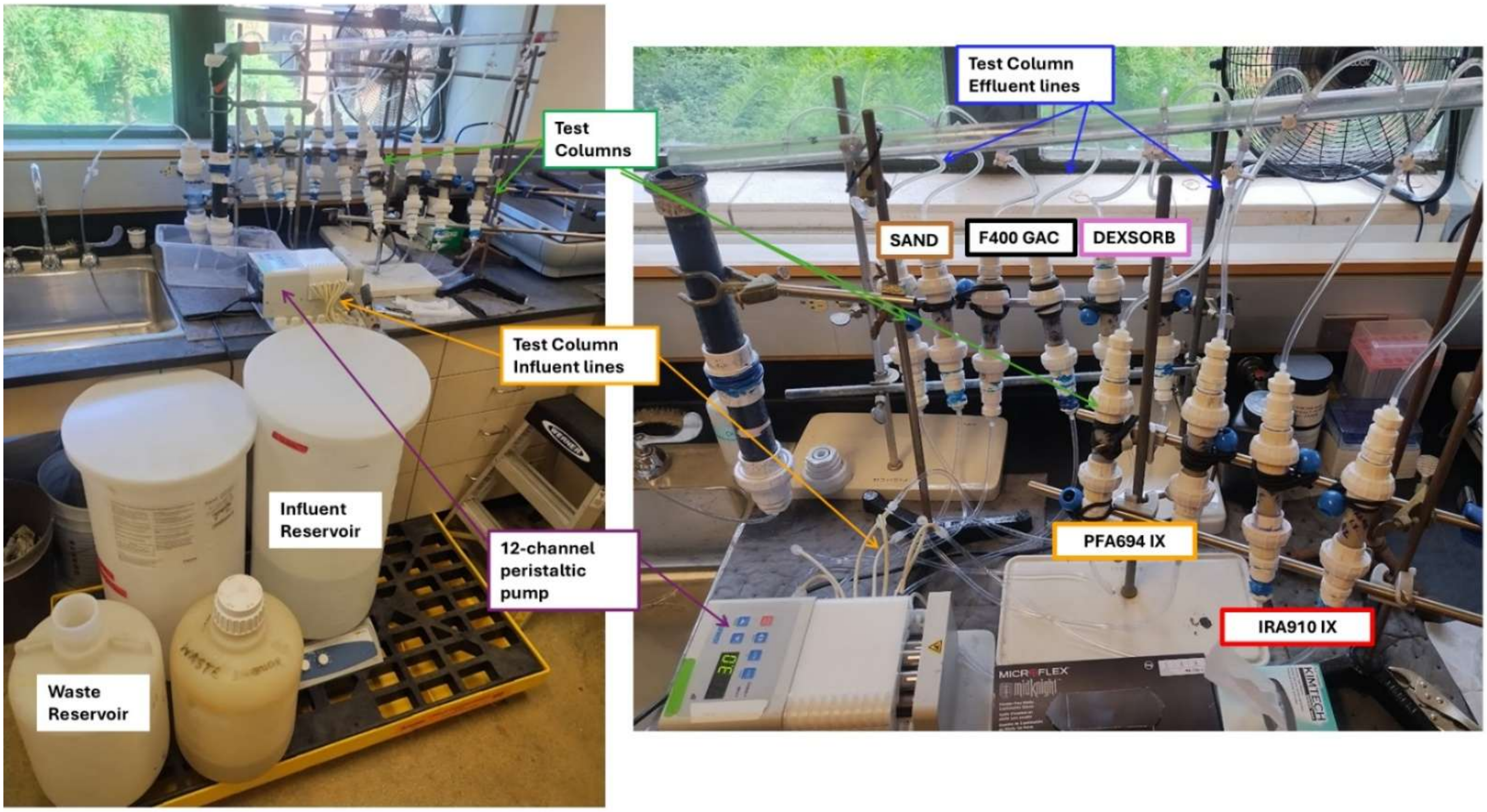


Figure S.4. Summary of the total PFAS percent removal for each of the seven evaluated adsorbents across eight batch tests conducted in ultrapure water. Initial nominal concentrations of each PFAS in the defined 18-PFAS system (**Table S.1**) varied from 5 µg/L to 2 mg/L.

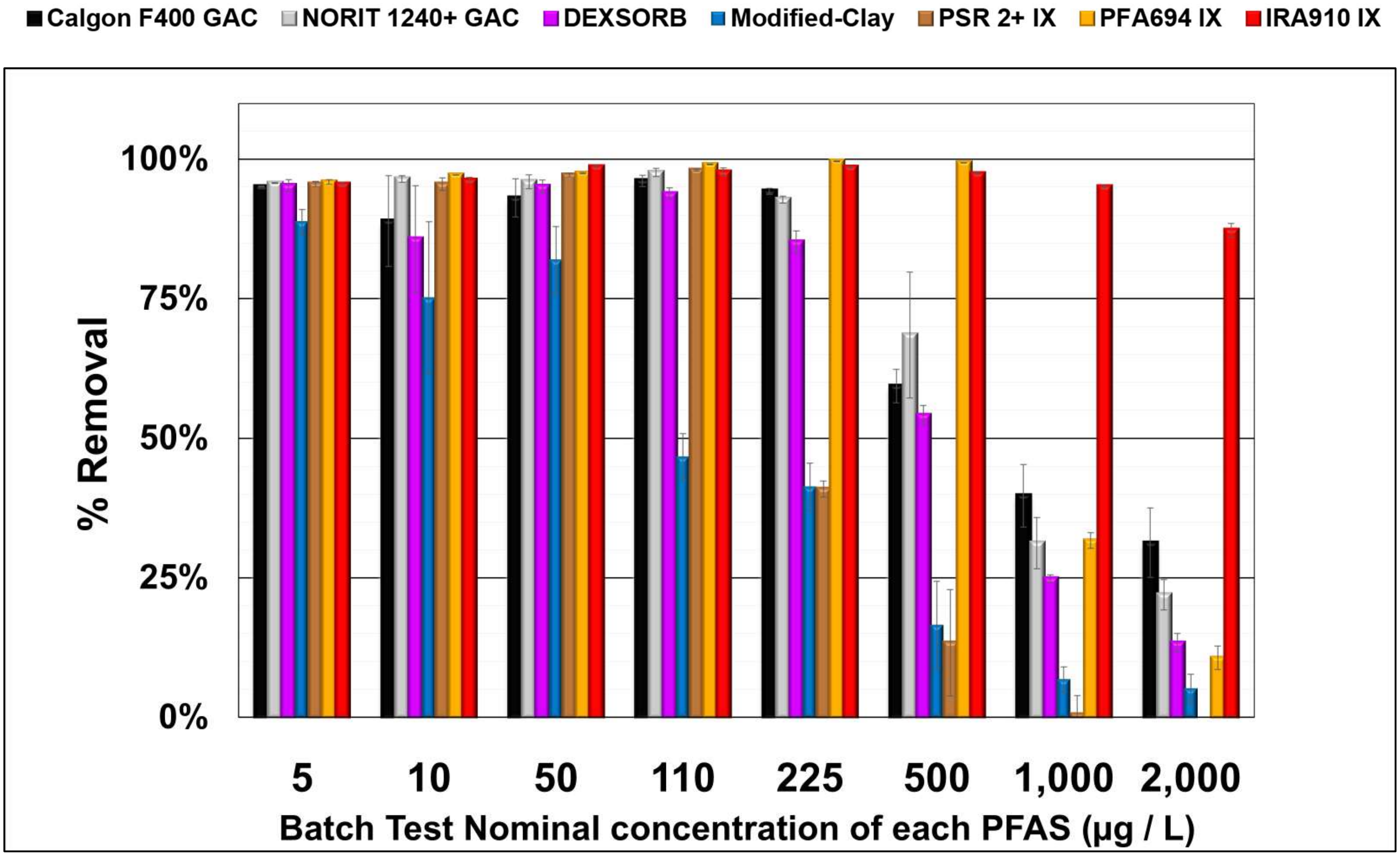


Figure S.5A Maximum achieved adsorption capacities for GACs for each of the 18 PFAS evaluated for the ultrapure water matrix adsorption isotherm tests – F400 GAC (above) and Norit 1240+ GAC (below). Side by Side Comparison of q_{max} expressed in terms of molar adsorption per unit sobent mass (left), and in terms of mass adsorbed per unit sorbent mass (right). Filled symbols represent HFPO-DA-DA and 6:2-FTS.

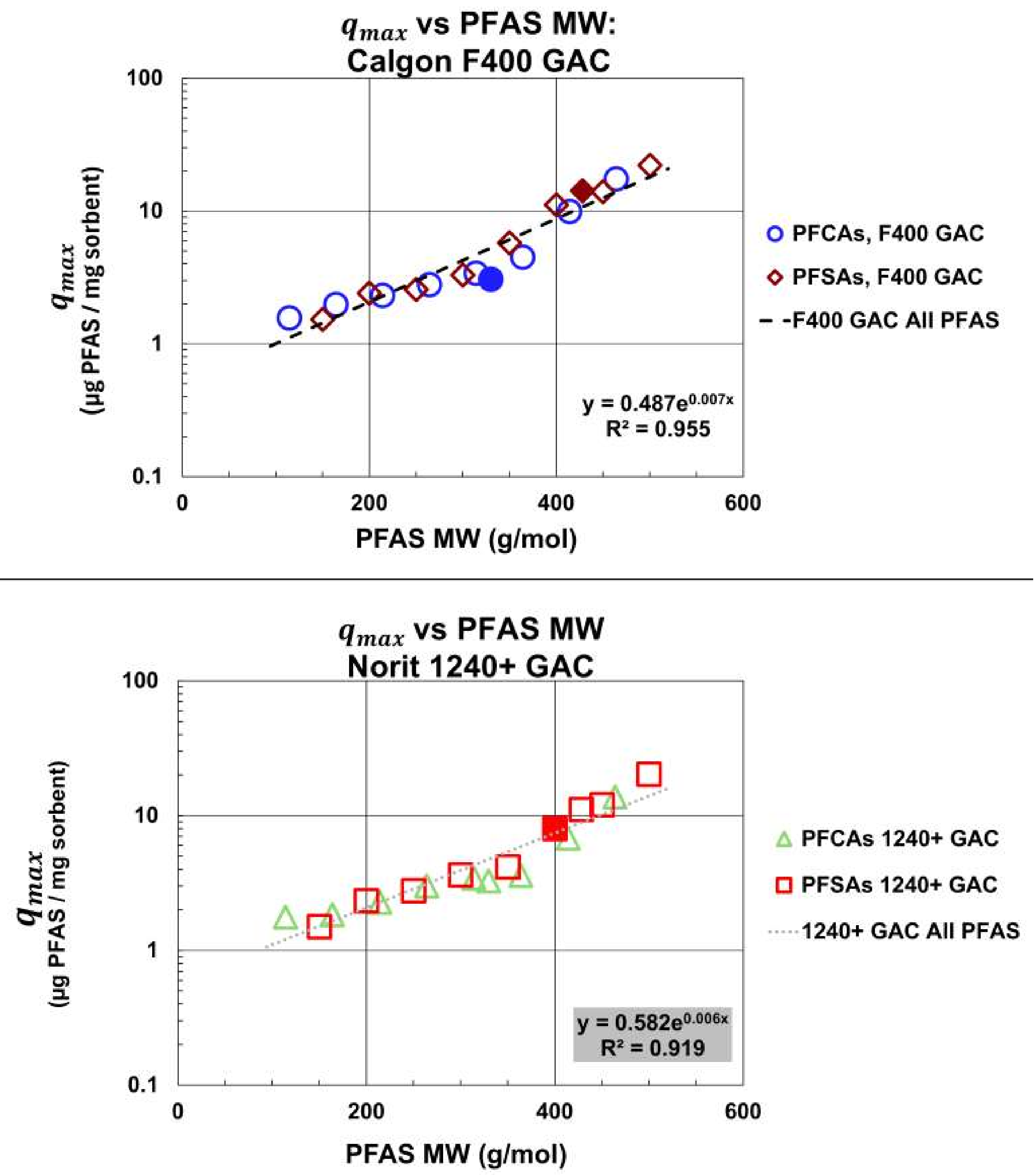


Figure S.5B Maximum achieved adsorption capacities: DEXSORB and SMC for each of the 18 PFAS evaluated for the ultrapure water matrix adsorption isotherm tests – DEXSORB (above) and the surface-modified clay (below) Filled symbols represent HFPO-DA-DA and 6:2-FTS.

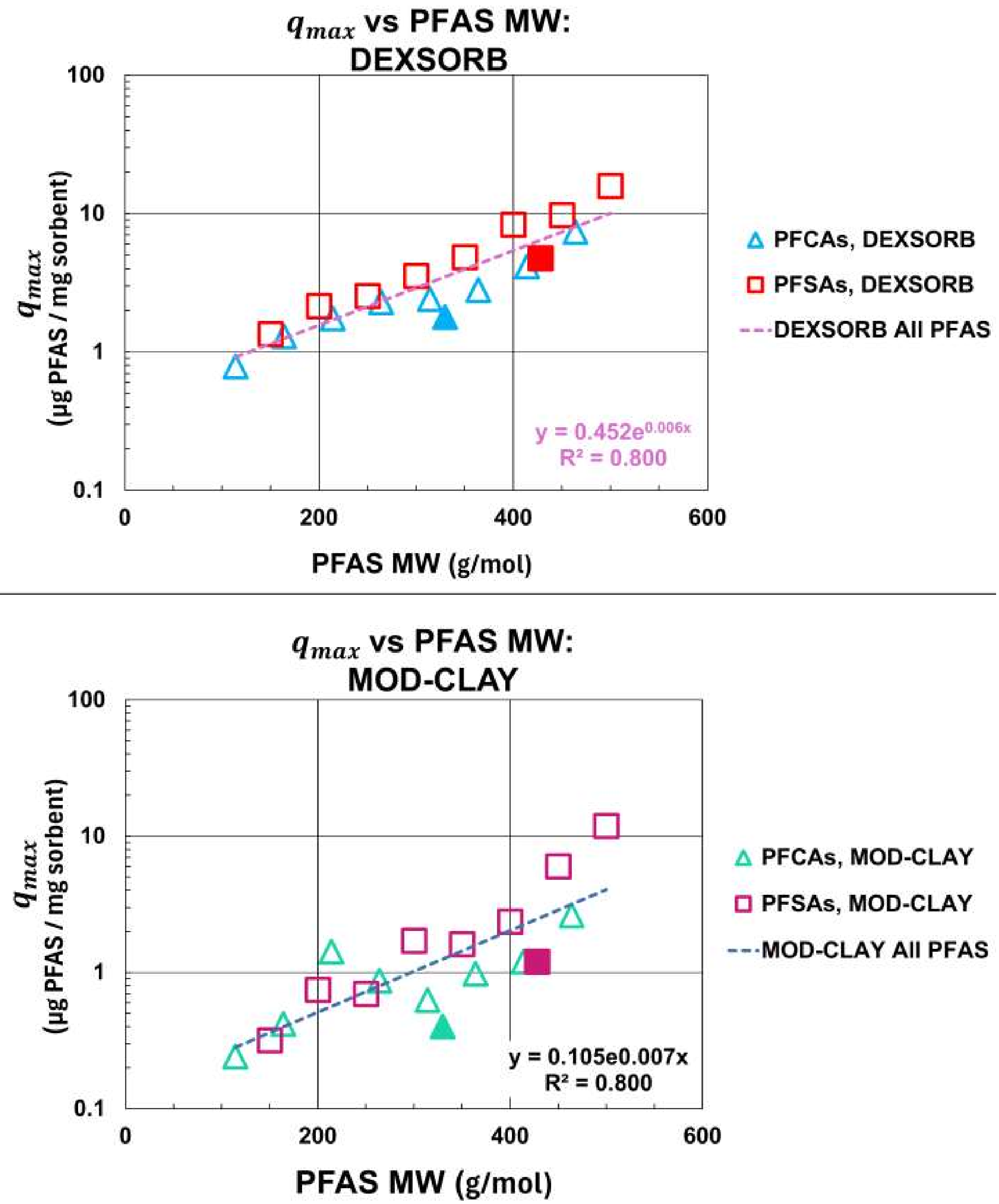


Figure S.5C Maximum achieved adsorption capacities for IX resins for each of the 18 PFAS evaluated for the ultrapure water matrix adsorption isotherm tests – IRA 910 IX (above) and the two PFAS-selective IX resins (below) Filled symbols represent HFPO-DA-DA and 6:2-FTS.

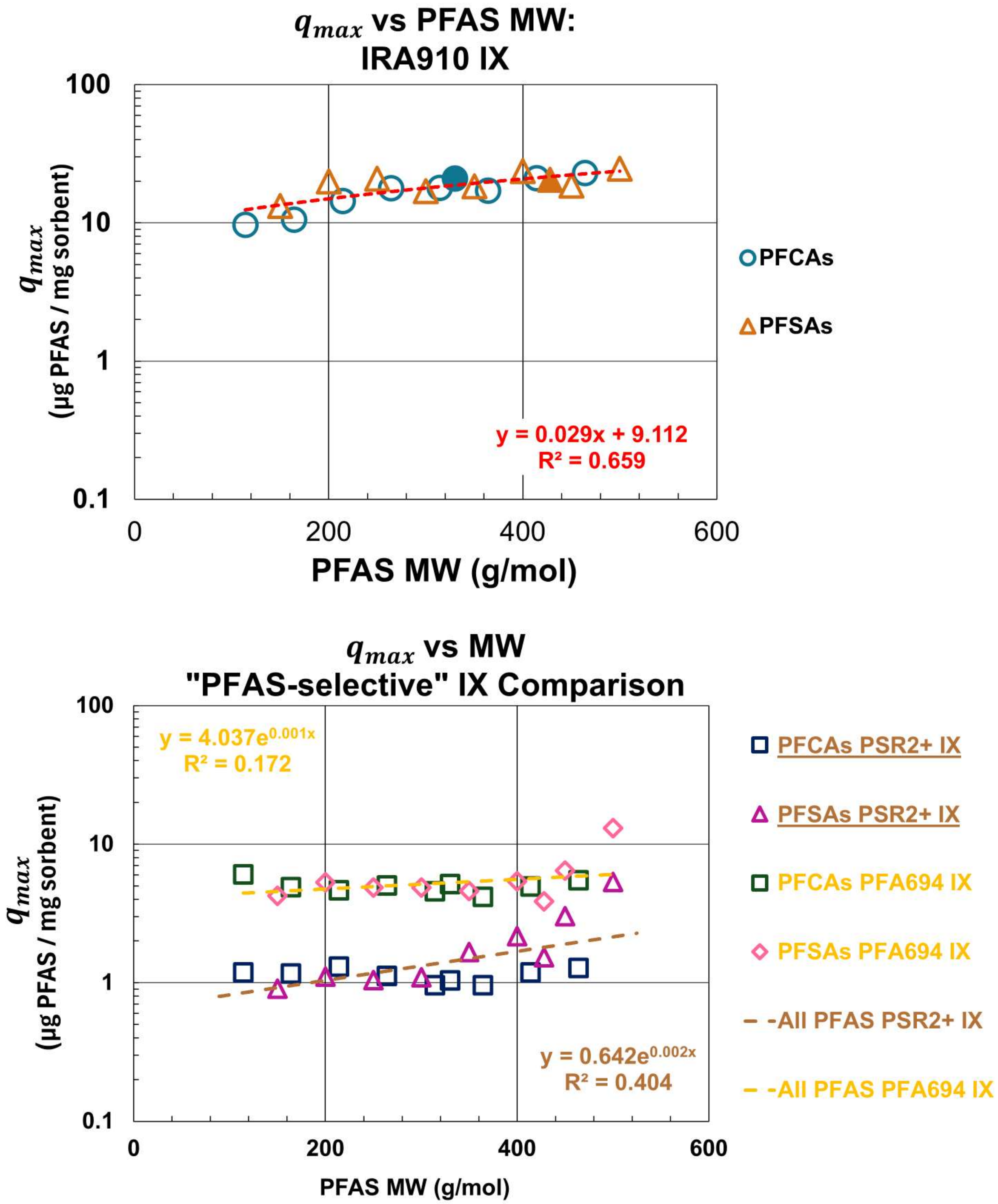


Figure S.6A Calgon F400 GAC – Adsorption kinetics for PFSAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1**), 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

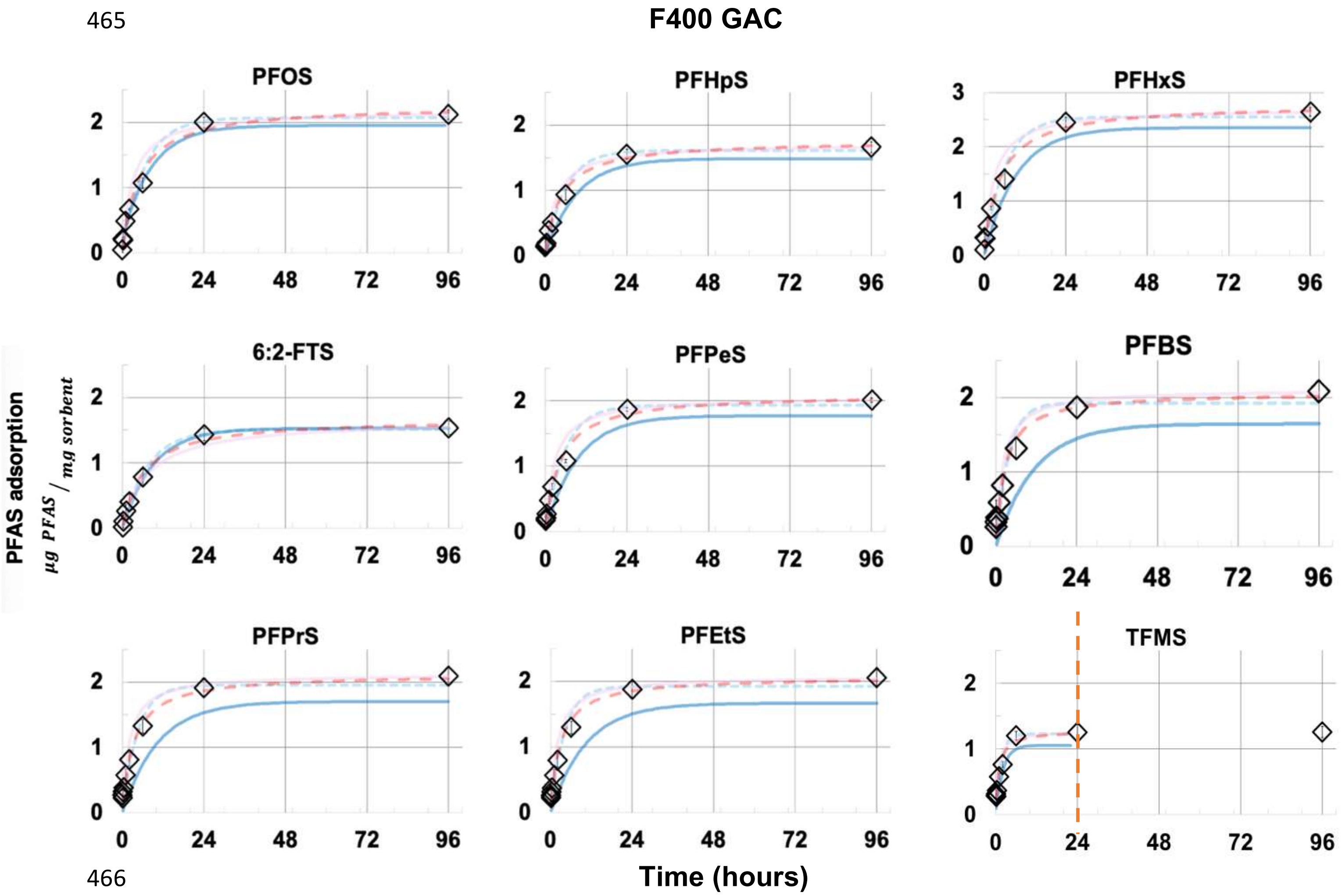


Figure S.6B Calgon F400 GAC – Adsorption kinetics for PFCAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

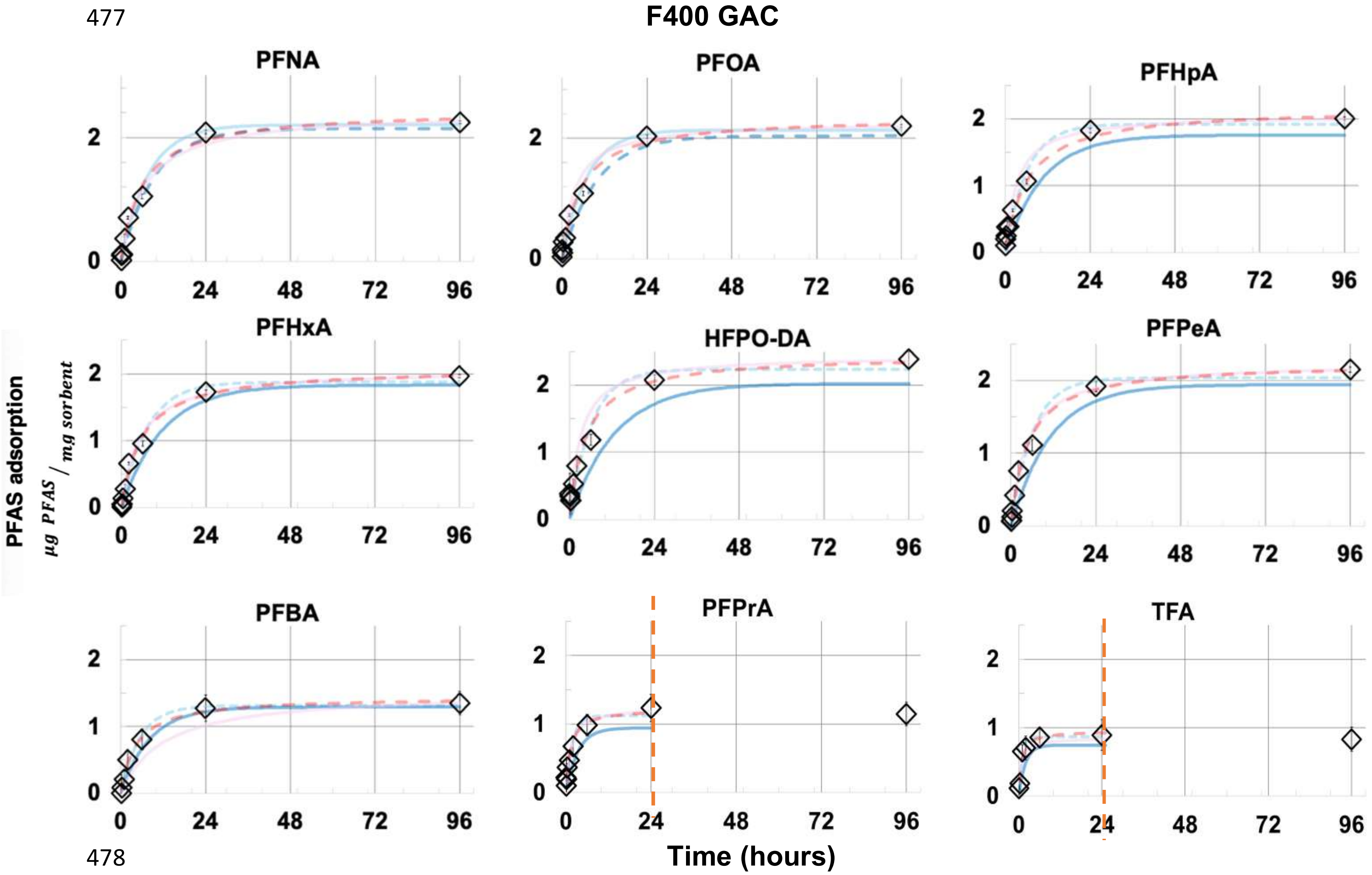


Figure S.6C Calgon F400 GAC – PSO kinetic model parameter v0 (µg PFAS / mg sorbent / hour), which is interpreted as the second-order initial adsorption velocity, plotted against the MW of the PFAS analytes in this study **(Table S.1)**. Filled symbols represent 6:2-FTS and HFPO-DA.

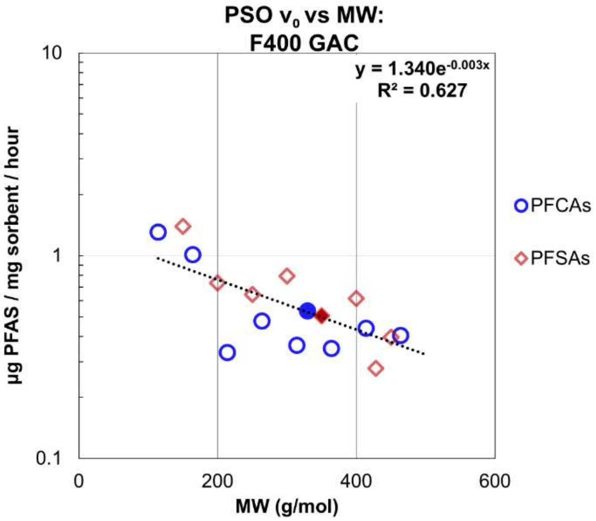


Table S.9 Calgon F400 GAC – Adsorption Kinetics Data and Model Parameters Summary

																slope	intercept	
		PFAS	CONTROL (C_0 [µg / L])	st dev	q_max [µg PFAS / mg sorbent]	st dev	PFO	q_e1	k_1	r^2	PSO	q_e2	k_2	V_0	r^2	k_IP	B_IP	r^2
								[µg PFAS / mg sorbent]	[1 / hours]			[µg PFAS / mg sorbent]	[mg sorbent / µg PFAS*hour]	[ug PFAS / (mg sorbent* hour)]		[µg PFAS / mg sorbent*hour^0.5]	[mm]	
		SUM ALL 18 PFAS	3835.62	55.94	33.72	1.21	*linear form*	30.3	0.13	0.972	*linear form*	34.4	0.01	14.7	0.998	7.80	0.61	0.994
							NON-linear form	32.2	0.20	0.986	*NON-linear form*	34.9	0.01	9.5	0.992			
		SUM PFCAs	1966.64	28.20	16.26	0.72	*linear form*	14.9	0.13	0.951	*linear form*	16.7	0.02	6.2	0.998	3.83	-0.02	0.984
							NON-linear form	15.5	0.19	0.985	*NON-linear form*	16.9	0.02	4.3	0.993			
MW (g/mol)	# CF_2/3	SUM PFSAs	1868.98	29.03	17.45	0.50	*linear form*	15.5	0.14	0.984	*linear form*	17.8	0.03	8.3	0.998	3.97	0.63	0.995
							NON-linear form	16.6	0.21	0.985	*NON-linear form*	18.0	0.02	5.2	0.989			
464.1	8	PFNA	225.56	2.61	2.25	0.03	*linear form*	2.1	0.11	0.996	*linear form*	2.4	0.06	0.4	0.975	0.47	-0.06	0.972
							NON-linear form	2.2	0.13	0.990	*NON-linear form*	2.4	0.07	0.4	0.990			
414.1	7	PFOA	220.67	7.97	2.20	0.08	*linear form*	2.0	0.10	0.996	*linear form*	2.3	0.12	0.6	0.995	0.46	-0.02	0.972
							NON-linear form	2.1	0.14	0.987	*NON-linear form*	2.4	0.08	0.4	0.989			
364.1	6	PFHpA	201.90	10.25	2.00	0.11	*linear form*	1.8	0.10	0.996	*linear form*	2.1	0.15	0.6	0.994	0.40	0.08	0.979
							NON-linear form	1.9	0.17	0.983	*NON-linear form*	2.2	0.07	0.3	0.993			
314.1	5	PFHxA	200.83	6.26	1.96	0.08	*linear form*	1.8	0.09	0.987	*linear form*	2.1	0.09	0.4	0.993	0.44	-0.09	0.967
							NON-linear form	1.9	0.14	0.986	*NON-linear form*	2.1	0.08	0.4	0.993			
330.0	5	HFPO-DA	250.21	8.23	2.39	0.12	*linear form*	2.0	0.08	0.994	*linear form*	2.4	0.14	0.8	0.996	0.40	0.19	0.927
							NON-linear form	2.2	0.16	0.972	*NON-linear form*	2.4	0.09	0.5	0.976			
264.1	4	PFPeA	235.82	8.71	2.14	0.04	*linear form*	1.9	0.09	0.988	*linear form*	2.2	0.10	0.5	0.993	0.49	-0.04	0.980
							NON-linear form	2.0	0.16	0.985	*NON-linear form*	2.2	0.10	0.5	0.994			
214.1	3	PFBA	192.04	10.86	1.35	0.18	*linear form*	1.3	0.12	0.989	*linear form*	1.5	0.05	0.1	0.832	0.40	-0.15	0.986
							NON-linear form	1.3	0.18	0.990	*NON-linear form*	1.4	0.16	0.3	0.995			
164.1	2	PFPrA	228.51	18.14	1.23	0.22	*linear form*	0.9	0.30	0.984	*linear form*	1.3	0.59	0.9	0.974	0.37	0.10	0.956
							NON-linear form	1.1	0.57	0.957	*NON-linear form*	1.2	0.68	1.0	0.965			
114.1	1	TFA	211.12	12.55	0.89	0.23	*linear form*	0.7	0.54	0.930	*linear form*	0.8	1.72	1.2	0.996	0.63	-0.13	0.894
							NON-linear form	0.9	1.08	0.969	*NON-linear form*	1.0	1.45	1.3	0.949			
500.1	8	PFOS	212.55	7.61	2.12	0.07	*linear form*	2.0	0.12	0.997	*linear form*	2.2	0.15	0.7	0.997	0.43	0.03	0.983
							NON-linear form	2.1	0.15	0.986	*NON-linear form*	2.3	0.09	0.5	0.985			
450.1	7	PFHpS	166.84	8.27	1.66	0.08	*linear form*	1.5	0.11	0.998	*linear form*	1.7	0.19	0.6	0.997	0.36	0.04	0.984
							NON-linear form	1.6	0.17	0.991	*NON-linear form*	1.8	0.13	0.4	0.991			
400.1	6	PFHxS	264.58	7.59	2.64	0.08	*linear form*	2.4	0.11	0.998	*linear form*	2.7	0.14	1.0	0.997	0.54	0.08	0.980
							NON-linear form	2.6	0.17	0.986	*NON-linear form*	2.8	0.08	0.6	0.986			
428.2	6	6:2-FTS	154.43	9.72	1.54	0.10	*linear form*	1.5	0.11	0.992	*linear form*	1.7	0.08	0.2	0.986	0.40	-0.18	0.930
							NON-linear form	1.5	0.13	0.973	*NON-linear form*	1.7	0.10	0.3	0.975			
350.1	5	PFPeS	202.01	3.24	2.01	0.04	*linear form*	1.8	0.11	0.998	*linear form*	2.1	0.19	0.8	0.998	0.41	0.07	0.992
							NON-linear form	1.9	0.18	0.986	*NON-linear form*	2.1	0.11	0.5	0.988			
300.1	4	PFBS	213.57	11.40	2.08	0.13	*linear form*	1.6	0.09	0.975	*linear form*	2.1	0.24	1.1	0.998	0.46	0.17	0.990
							NON-linear form	1.9	0.27	0.970	*NON-linear form*	2.1	0.19	0.8	0.977			
250.1	3	PFPrS	230.46	7.64	2.10	0.14	*linear form*	1.7	0.10	0.982	*linear form*	2.1	0.24	1.1	0.999	0.48	0.13	0.990
							NON-linear form	2.0	0.23	0.986	*NON-linear form*	2.1	0.14	0.6	0.992			
200.1	2	PFEtS	225.72	7.48	2.05	0.13	*linear form*	1.7	0.10	0.982	*linear form*	2.1	0.24	1.0	0.999	0.47	0.13	0.990
							NON-linear form	1.9	0.25	0.978	*NON-linear form*	2.1	0.17	0.7	0.985			
150.1	1	TFMS	198.83	3.47	1.26	0.08	*linear form*	1.1	0.49	0.991	*linear form*	1.3	1.12	1.8	0.997	0.42	0.17	0.986
							NON-linear form	1.2	0.66	0.962	*NON-linear form*	1.3	0.85	1.4	0.948			

Figure S.7A DEXSORB – Adsorption kinetics for PFSAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

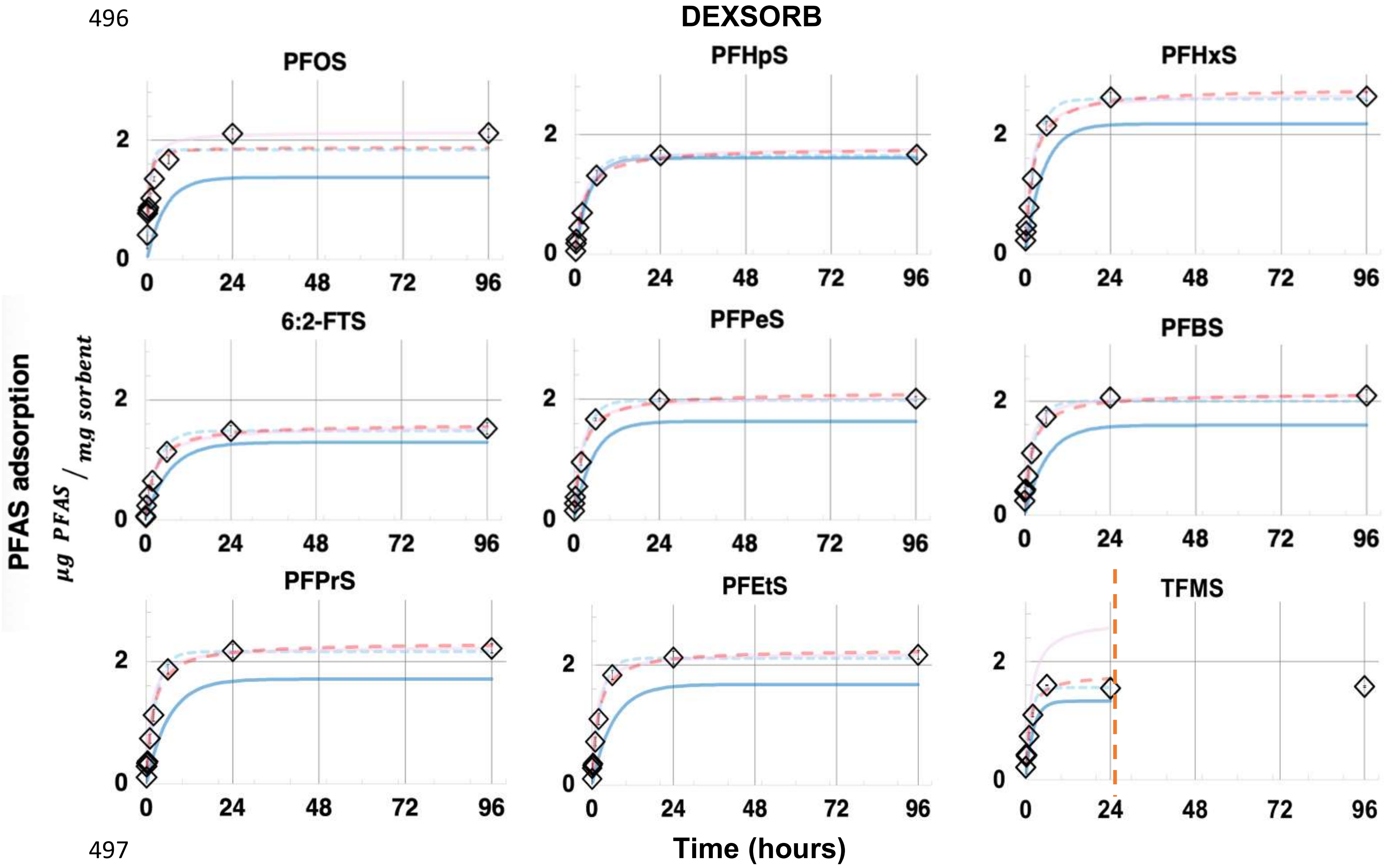


Figure S.7B DEXSORB – Adsorption kinetics for PFCAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

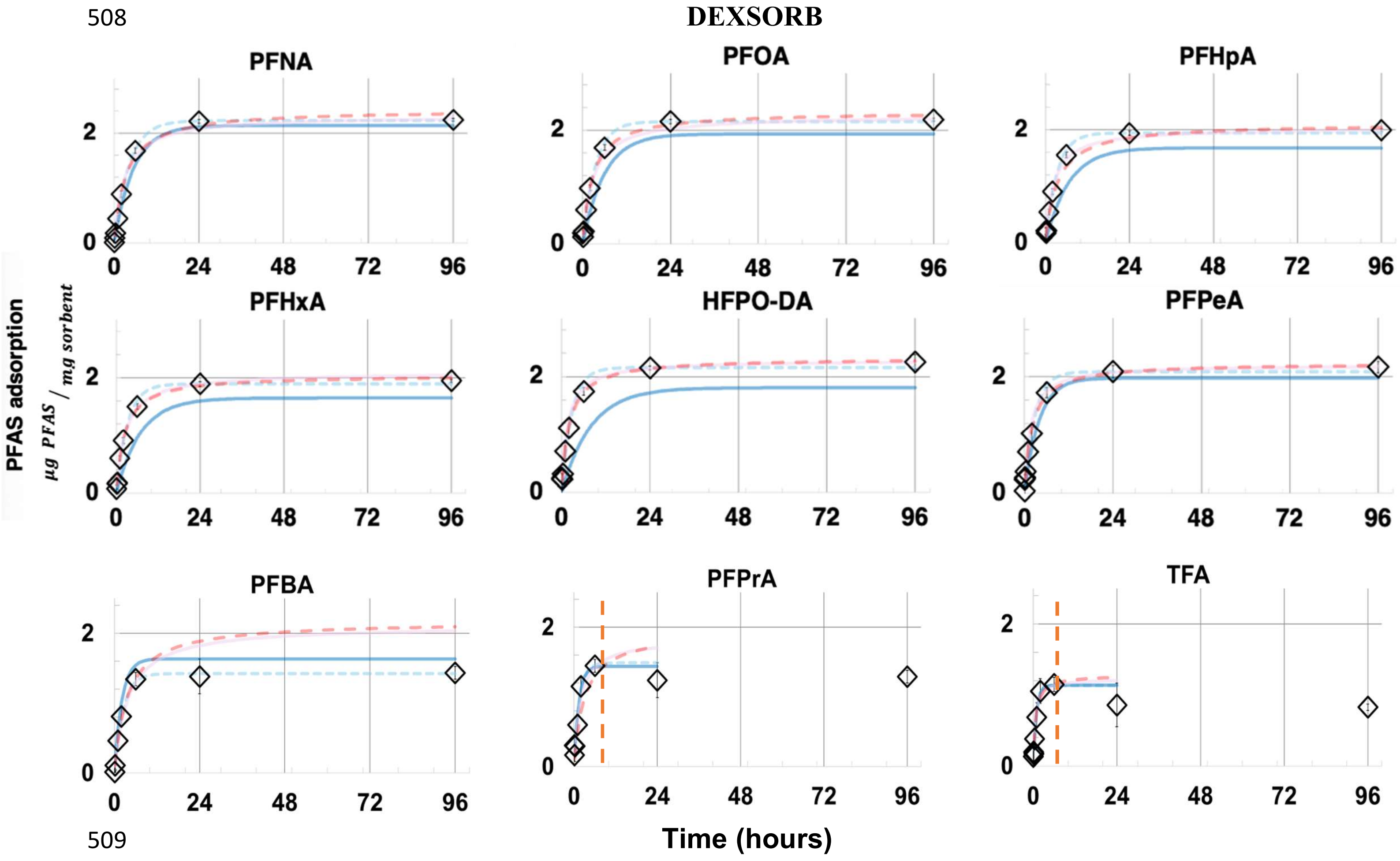


Figure S.7C DEXSORB – PSO kinetic model parameter v0 (µg PFAS / mg sorbent / hour), which is interpreted as the second-order initial adsorption velocity, plotted against the MW of the PFAS analytes in this study **(Table S.1)**. Filled symbols represent 6:2-FTS and HFPO-DA. Exponential fit excludes PFOS.

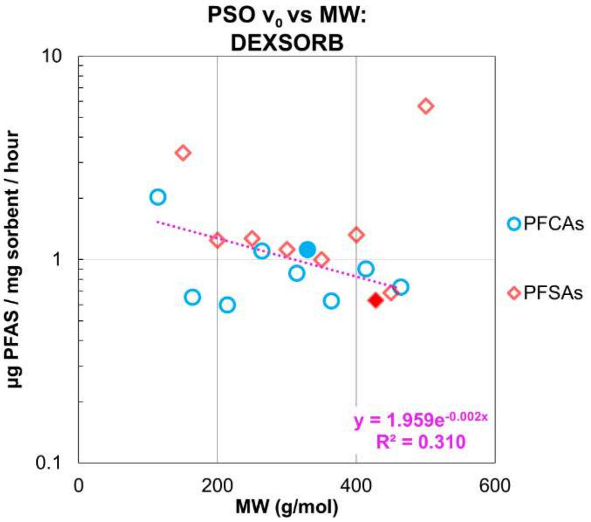


Table S.10 DEXSORB – Adsorption Kinetics Data and Model Parameters Summary

																Intraparticle Diffusion Model Linear Fit		
																slope	intercept	
[redacted]	[redacted]	PFAS	CONTROL (C_0 [µg / L])	st dev	q_max [µg PFAS / mg sorbent]	st dev	PFO	q_e1 [µg PFAS / mg sorbent]	k_1 [1 / hours]	r^2	PSO	q_e2 [µg PFAS / mg sorbent]	k_2 [mg sorbent / µg PFAS*hour]	V_0 [ug PFAS / (mg sorbent* hour)]	r^2	k_IP [µg PFAS / mg sorbent*hour^0.5]	B_IP [mm]	r^2
[redacted]	[redacted]	SUM ALL 18 PFAS	3835.62	55.94	34.35	0.74	*linear form*	31.4	0.29	0.993	*linear form*	34.8	0.02	26.4	1.000	12.19	-0.42	0.991
							NON-linear form	33.4	0.41	0.991	*NON-linear form*	35.7	0.02	20.2	0.992			
[redacted]	[redacted]	SUM PFCAs	1966.64	28.20	16.34	0.54	*linear form*	15.5	0.31	0.991	*linear form*	16.6	0.04	11.4	1.000	6.22	-0.90	0.987
							NON-linear form	15.9	0.40	0.994	*NON-linear form*	17.1	0.03	9.1	0.993			
MW (g/mol)	# CF_2/3	SUM PFSAs	1868.98	29.03	18.01	0.28	*linear form*	15.9	0.28	0.994	*linear form*	18.2	0.05	16.6	1.000	5.97	0.48	0.993
							NON-linear form	17.5	0.42	0.985	*NON-linear form*	18.6	0.03	11.2	0.986			
464.1	8	PFNA	225.56	2.61	2.24	0.02	*linear form*	2.1	0.18	0.994	*linear form*	2.3	0.15	0.8	0.999	0.80	-0.27	0.994
							NON-linear form	2.2	0.24	0.994	*NON-linear form*	2.4	0.12	0.7	0.990			
~~414.1~~	7	PFOA	220.67	7.97	2.19	0.08	*linear form*	1.9	0.17	0.987	*linear form*	2.3	0.16	0.8	0.999	0.77	-0.16	0.987
							NON-linear form	2.2	0.29	0.992	*NON-linear form*	2.3	0.17	0.9	0.992			
364.1	6	PFHpA	201.90	10.25	1.99	0.10	*linear form*	1.7	0.15	0.975	*linear form*	2.0	0.22	0.9	0.998	0.67	-0.09	0.988
							NON-linear form	1.9	0.31	0.994	*NON-linear form*	2.1	0.14	0.6	0.992			
314.1	5	PFHxA	200.83	6.26	1.95	0.07	*linear form*	1.7	0.14	0.969	*linear form*	2.1	0.19	0.8	0.987	0.68	-0.12	0.990
							NON-linear form	1.9	0.32	0.994	*NON-linear form*	2.0	0.21	0.9	0.997			
330.0	5	HFPO-DA	250.21	8.23	2.25	0.12	*linear form*	1.8	0.13	0.944	*linear form*	2.3	0.27	1.4	0.991	0.78	-0.09	0.979
							NON-linear form	2.2	0.36	0.985	*NON-linear form*	2.3	0.21	1.1	0.992			
264.1	4	PFPeA	235.82	8.71	2.16	0.10	*linear form*	2.0	0.26	0.994	*linear form*	2.2	0.29	1.4	0.994	0.72	-0.02	0.998
							NON-linear form	2.1	0.36	0.992	*NON-linear form*	2.2	0.22	1.1	0.994			
214.1	3	PFBA	192.04	10.86	1.44	0.09	*linear form*	1.6	0.48	0.999	*linear form*	2.1	0.13	0.6	0.218	0.67	-0.23	0.972
							NON-linear form	1.4	0.41	0.986	*NON-linear form*	2.2	0.13	0.6	0.929			
164.1	2	PFPrA	228.51	18.14	1.45	0.19	*linear form*	1.4	0.74	0.950	*linear form*	1.8	0.32	1.1	0.909	0.64	-0.01	0.934
							NON-linear form	1.5	0.65	0.960	*NON-linear form*	1.9	0.17	0.7	0.950			
114.1	1	TFA	211.12	12.55	1.15	0.10	*linear form*	1.1	1.17	0.975	*linear form*	1.2	1.56	2.4	0.978	0.75	-0.04	0.975
							NON-linear form	1.1	1.19	0.921	*NON-linear form*	1.3	1.24	2.0	0.964			
500.1	8	PFOS	212.55	7.61	2.12	0.07	*linear form*	1.4	0.20	0.995	*linear form*	2.1	0.70	3.2	0.995	0.49	0.56	0.929
							NON-linear form	1.8	1.37	0.807	*NON-linear form*	1.9	1.61	5.7	0.835			
450.1	7	PFHpS	166.84	8.27	1.66	0.08	*linear form*	1.6	0.26	0.996	*linear form*	1.8	0.26	0.8	0.982	0.57	-0.10	0.997
							NON-linear form	1.6	0.29	0.995	*NON-linear form*	1.8	0.22	0.7	0.991			
400.1	6	PFHxS	264.58	7.59	2.64	0.07	*linear form*	2.2	0.20	0.993	*linear form*	2.7	0.24	1.7	1.000	0.93	-0.11	0.984
							NON-linear form	2.6	0.35	0.984	*NON-linear form*	2.8	0.17	1.3	0.986			
428.2	6	6:2-FTS	154.43	9.72	1.53	0.10	*linear form*	1.3	0.15	0.986	*linear form*	1.6	0.25	0.6	0.997	0.51	-0.09	0.992
							NON-linear form	1.5	0.29	0.992	*NON-linear form*	1.6	0.25	0.6	0.995			
350.1	5	PFPeS	202.01	3.24	2.01	0.03	*linear form*	1.6	0.19	0.987	*linear form*	2.0	0.31	1.3	0.999	0.74	-0.12	0.974
							NON-linear form	2.0	0.34	0.979	*NON-linear form*	2.1	0.22	1.0	0.979			
300.1	4	PFBS	213.57	11.40	2.10	0.11	*linear form*	1.6	0.17	0.979	*linear form*	2.1	0.37	1.7	1.000	0.63	0.16	0.985
							NON-linear form	2.0	0.37	0.987	*NON-linear form*	2.1	0.24	1.1	0.983			
250.1	3	PFPrS	230.46	7.64	2.21	0.07	*linear form*	1.7	0.16	0.957	*linear form*	2.2	0.37	1.9	1.000	0.76	0.01	0.994
							NON-linear form	2.2	0.40	0.993	*NON-linear form*	2.3	0.24	1.3	0.989			
200.1	2	PFEtS	225.72	7.48	2.17	0.07	*linear form*	2.0	0.30	0.998	*linear form*	2.2	0.38	1.8	1.000	0.74	0.01	0.994
							NON-linear form	2.1	0.40	0.993	*NON-linear form*	2.3	0.24	1.2	0.989			
150.1	1	TFMS	198.83	3.47	1.60	0.01	*linear form*	1.3	0.42	0.909	*linear form*	1.2	2.56	3.5	0.911	0.60	0.16	0.982
							NON-linear form	1.0	2.26	0.780	*NON-linear form*	1.1	2.59	3.4	0.863			

Figure S.8A IRA910 IX – Adsorption kinetics for PFSAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

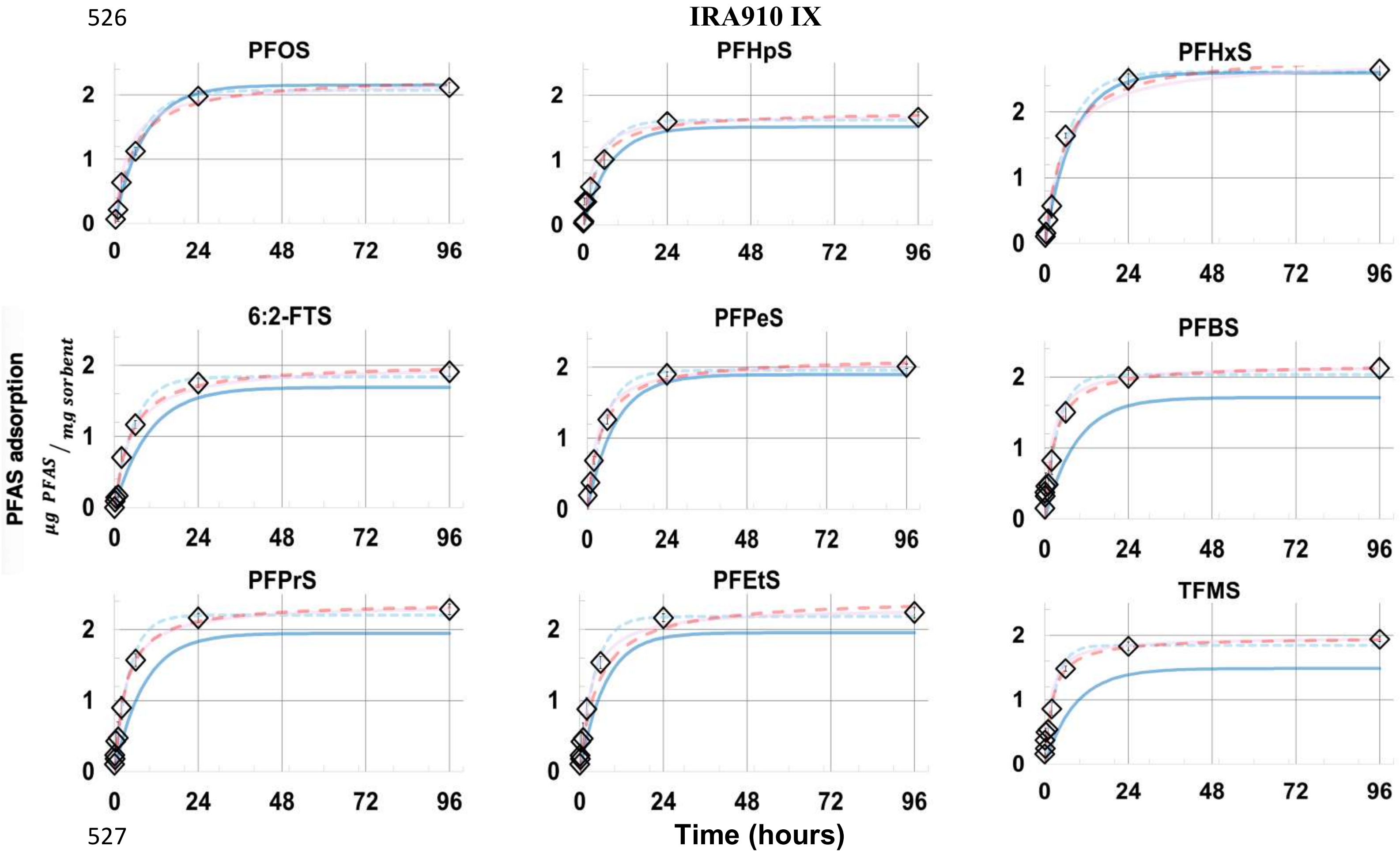


Figure S.8B IRA910 IX – Adsorption kinetics for PFCAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

IRA910 IX

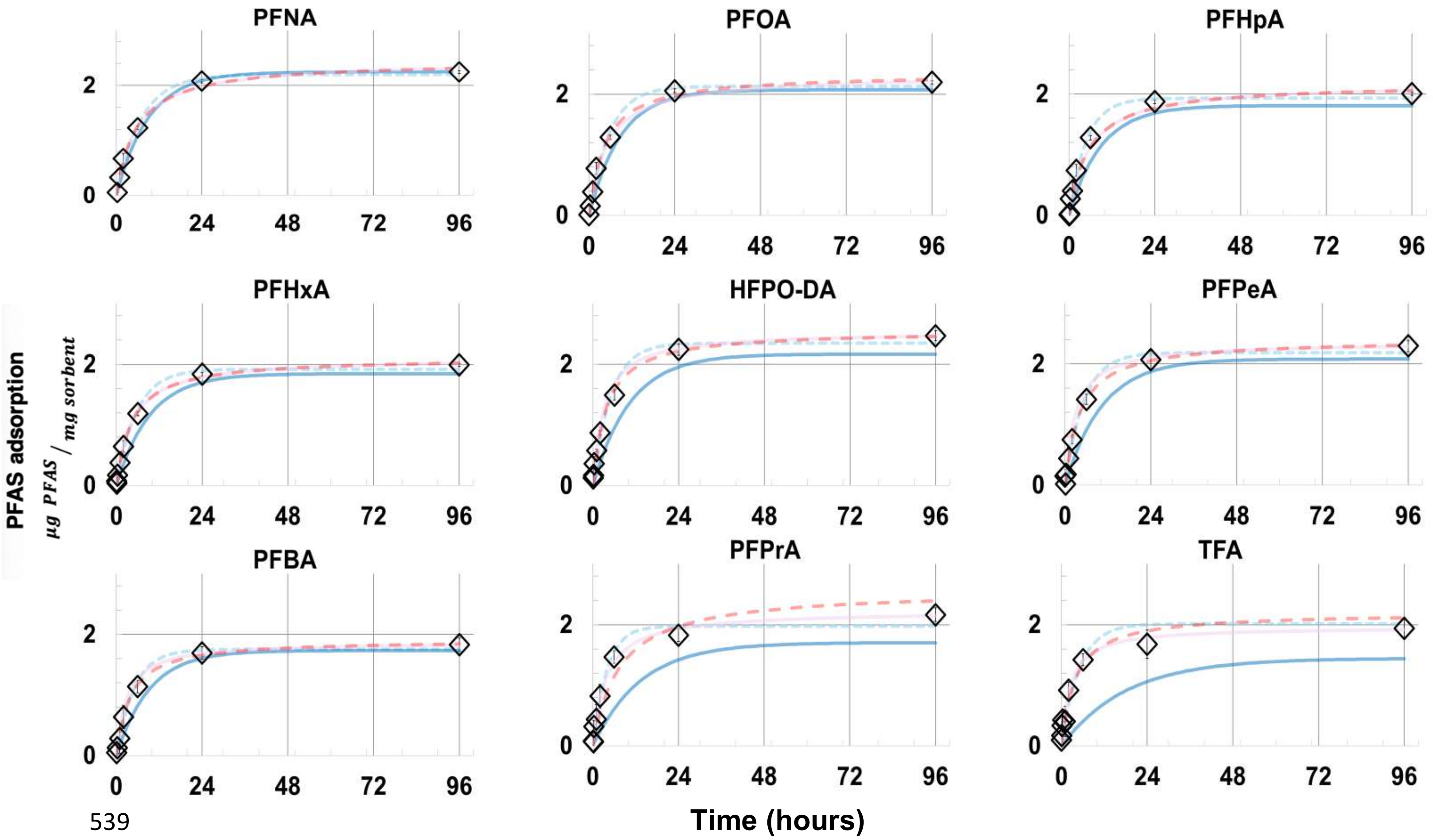


Figure S.8C. IRA910 IX - PSO kinetic model parameter v0 (µg PFAS / mg sorbent / hour), which is interpreted as the second-order initial adsorption velocity, plotted against the MW of the PFAS analytes in this study **(Table S.1)**. Filled symbols represent 6:2-FTS and HFPO-DA.

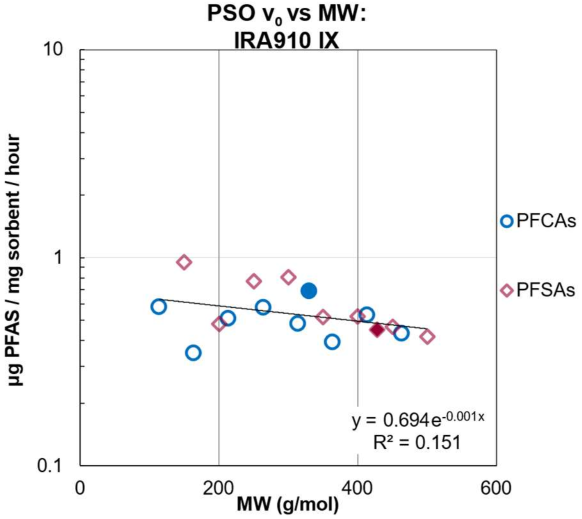


Table S.11 IRA910 IX – Adsorption Kinetics Data and Model Parameters Summary

																Intraparticle Diffusion Model Linear Fit		
																slope	intercept	
[redacted]	[redacted]	PFAS	CONTROL (C₀ [µg / L])	st dev	q_max [µg PFAS / mg sorbent]	st dev	PFO	q_e1 [µg PFAS / mg sorbent]	k_1 [1 / hours]	r^2	PSO	q_e2 [µg PFAS / mg sorbent]	k_2 [mg sorbent / µg PFAS*hour]	V_0 [ug PFAS / (mg sorbent* hour)	r^2	k_IP [µg PFAS / mg sorbent*hour^0.5]	B_IP [mm]	r^2
		SUM ALL 18 PFAS	3873.75	57.64	38.06	0.54	*linear form*	34.3	0.11	0.979	*linear form*	42.2	0.00	4.7	0.859	10.72	-2.23	0.992
							NON-linear form	36.6	0.20	0.995	*NON-linear form*	40.2	0.01	10.1	0.998			
		SUM PFCAs	1966.64	28.20	19.14	0.23	*linear form*	17.2	0.10	0.969	*linear form*	20.3	0.01	3.8	0.991	5.46	-1.37	0.992
							NON-linear form	18.2	0.20	0.992	*NON-linear form*	20.0	0.01	5.0	0.998			
MW (g/mol)	# CF_2/3	SUM PFSAs	1907.11	35.64	18.92	0.36	*linear form*	18.1	0.17	0.993	*linear form*	19.7	0.01	5.6	0.999	5.26	-0.86	0.989
							NON-linear form	18.7	0.14	0.992	*NON-linear form*	20.9	0.01	3.6	0.990			
464.1	8	PFNA	225.56	2.61	2.24	0.03	*linear form*	2.2	0.11	0.989	*linear form*	2.5	0.05	0.3	0.990	0.65	-0.34	0.984
							NON-linear form	2.2	0.15	0.988	*NON-linear form*	2.4	0.07	0.4	0.992			
414.1	7	PFOA	220.67	7.97	2.20	0.08	*linear form*	2.1	0.11	0.990	*linear form*	2.3	0.09	0.5	0.997	0.61	-0.18	0.977
							NON-linear form	2.1	0.18	0.991	*NON-linear form*	2.3	0.10	0.5	0.996			
364.1	6	PFHpA	201.90	10.25	2.01	0.10	*linear form*	1.8	0.11	0.981	*linear form*	2.1	0.12	0.5	0.998	0.58	-0.13	0.985
							NON-linear form	1.9	0.21	0.991	*NON-linear form*	2.2	0.08	0.4	0.990			
314.1	5	PFHxA	200.83	6.26	1.99	0.06	*linear form*	1.8	0.11	0.986	*linear form*	2.1	0.12	0.5	0.999	0.54	-0.14	0.968
							NON-linear form	1.9	0.18	0.991	*NON-linear form*	2.1	0.11	0.5	0.994			
330.0	5	HFPO-DA	250.21	8.23	2.47	0.08	*linear form*	2.2	0.10	0.979	*linear form*	2.5	0.13	0.9	0.998	0.64	-0.06	0.997
							NON-linear form	2.3	0.20	0.988	*NON-linear form*	2.6	0.11	0.7	0.996			
264.1	4	PFPeA	235.82	8.71	2.30	0.09	*linear form*	2.1	0.10	0.971	*linear form*	2.4	0.15	0.8	0.997	0.63	-0.15	0.957
							NON-linear form	2.2	0.19	0.989	*NON-linear form*	2.4	0.10	0.6	0.994			
214.1	3	PFBA	192.04	10.86	1.83	0.11	*linear form*	1.7	0.11	0.974	*linear form*	1.9	0.19	0.7	0.999	0.57	-0.24	0.974
							NON-linear form	1.8	0.20	0.985	*NON-linear form*	1.9	0.14	0.5	0.991			
164.1	2	PFPrA	228.51	18.14	2.16	0.16	*linear form*	1.7	0.07	0.795	*linear form*	2.2	0.12	0.6	0.997	0.67	-0.17	0.986
							NON-linear form	2.0	0.26	0.979	*NON-linear form*	2.6	0.05	0.3	0.954			
114.1	1	TFA	211.12	12.55	1.94	0.15	*linear form*	1.4	0.06	0.672	*linear form*	2.0	0.21	0.8	0.993	0.56	0.03	0.959
							NON-linear form	2.0	0.20	0.972	*NON-linear form*	2.2	0.12	0.6	0.978			
500.1	8	PFOS	212.55	7.61	2.11	0.08	*linear form*	2.2	0.12	0.993	*linear form*	2.2	0.12	0.6	0.999	0.48	-0.23	0.970
							NON-linear form	2.1	0.15	0.988	*NON-linear form*	2.3	0.08	0.4	0.991			
450.1	7	PFHpS	166.84	8.27	1.66	0.08	*linear form*	1.5	0.13	0.995	*linear form*	1.7	0.25	0.7	0.999	0.34	0.03	0.963
							NON-linear form	1.6	0.20	0.980	*NON-linear form*	1.8	0.15	0.5	0.983			
400.1	6	PFHxS	264.58	7.59	2.64	0.08	*linear form*	2.6	0.12	0.992	*linear form*	2.8	0.06	0.5	0.993	0.58	-0.18	0.964
							NON-linear form	2.6	0.15	0.993	*NON-linear form*	2.9	0.06	0.5	0.988			
428.2	6	6:2-FTS	192.56	6.79	1.91	0.07	*linear form*	1.7	0.10	0.978	*linear form*	2.0	0.10	0.4	0.993	0.54	-0.17	0.944
							NON-linear form	1.8	0.18	0.987	*NON-linear form*	2.0	0.11	0.5	0.989			
350.1	5	PFPeS	202.01	3.24	2.01	0.03	*linear form*	1.9	0.12	0.986	*linear form*	2.1	0.16	0.7	0.998	0.59	-0.20	0.951
							NON-linear form	2.0	0.19	0.987	*NON-linear form*	2.1	0.11	0.5	0.988			
300.1	4	PFBS	213.57	11.40	2.12	0.11	*linear form*	1.7	0.11	0.974	*linear form*	2.2	0.23	1.1	0.998	0.54	0.11	0.960
							NON-linear form	2.0	0.27	0.978	*NON-linear form*	2.2	0.17	0.8	0.975			
250.1	3	PFPrS	230.46	7.64	2.29	0.08	*linear form*	1.9	0.12	0.981	*linear form*	2.4	0.14	0.8	0.995	0.63	-0.01	0.977
							NON-linear form	2.2	0.24	0.989	*NON-linear form*	2.4	0.13	0.8	0.990			
200.1	2	PFEtS	225.72	7.48	2.24	0.07	*linear form*	2.0	0.14	0.993	*linear form*	2.3	0.14	0.8	0.995	0.61	-0.01	0.977
							NON-linear form	2.2	0.24	0.990	*NON-linear form*	2.4	0.08	0.5	0.988			
150.1	1	TFMS	198.83	3.47	1.94	0.04	*linear form*	1.5	0.11	0.948	*linear form*	2.0	0.32	1.3	0.999	0.55	0.10	0.967
							NON-linear form	1.8	0.34	0.974	*NON-linear form*	2.0	0.25	1.0	0.973			

Figure S.9A PFA694 IX – Adsorption kinetics for PFSAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

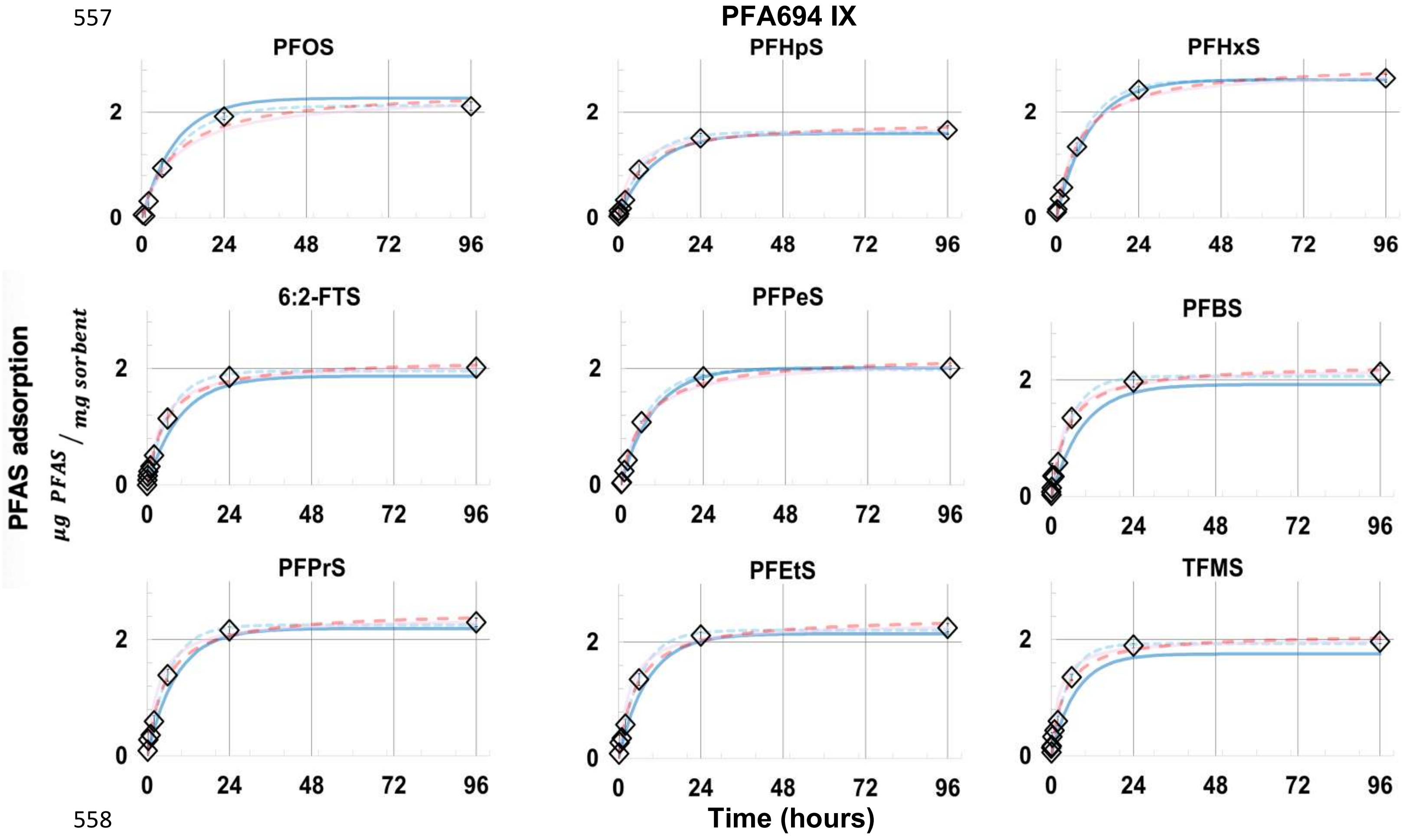


Figure S.9B PFA694 IX – Adsorption kinetics for PFCAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

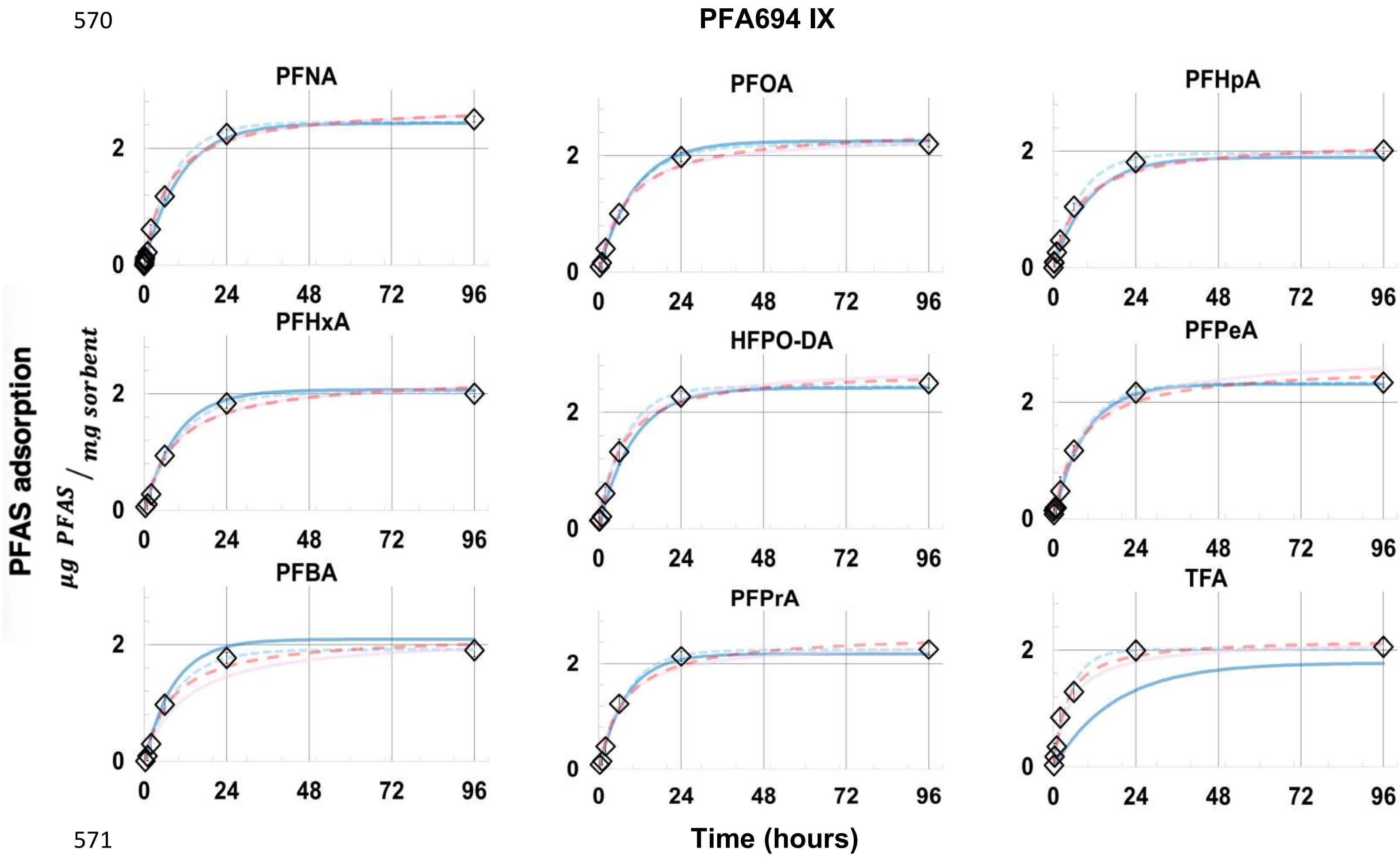


Figure S.9C. PFA694 IX - PSO kinetic model parameter v0 (µg PFAS / mg sorbent / hour), which is interpreted as the second-order initial adsorption velocity, plotted against the MW of the PFAS analytes in this study **(Table S.1)**. Filled symbols represent 6:2-FTS and HFPO-DA.

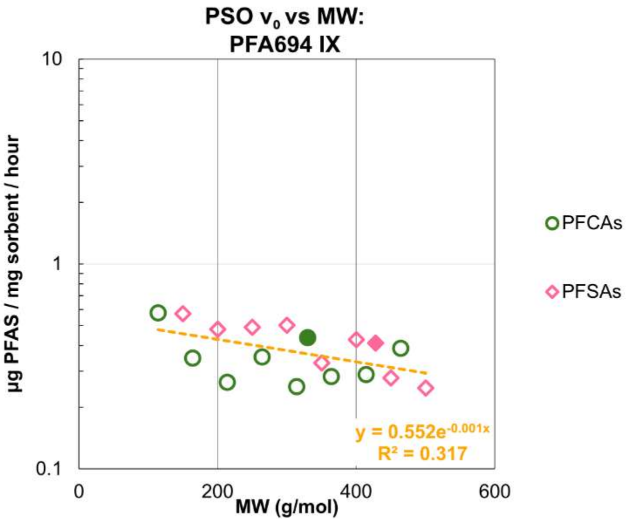


Table S.12 PFA694 IX – Adsorption Kinetics Data and Model Parameters Summary

																slope	intercept	
[redacted]	[redacted]	PFAS	CONTROL (C_0 [µg / L])	st dev	q_max [µg PFAS / mg sorbent]	st dev	PFO	q_e1	k_1	r^2	PSO	q_e2	k_2	V_0	r^2	k_IP	B_IP	r^2
								[µg PFAS / mg sorbent]	[1 / hours]			[µg PFAS / mg sorbent]	[mg sorbent / µg PFAS*hour]	[ug PFAS / (mg sorbent* hour)]		[µg PFAS / mg sorbent*hour^0.5]	[mm]	
[redacted]	[redacted]	SUM ALL 18 PFAS	3908.59	53.75	38.85	0.545	linear form	37.17	0.106	0.997	linear form	41.70	0.0	6.491	1.00	9.63	-3.615	0.98
							NON-linear form	38.28	0.131	0.996	NON-linear form	42.99	0.0	6.638				
[redacted]	[redacted]	SUM PFCAs	1991.41	25.80	19.77	0.256	linear form	19.38	0.105	0.998	linear form	21.47	0.0	2.870	1.00	4.83	-2.134	0.98
							NON-linear form	19.57	0.120	0.997	NON-linear form	22.06	0.0	3.107				
[redacted]	[redacted]	SUM PFSAs	1917.18	41.51	19.08	0.415	linear form	19.06	0.140	0.990	linear form	20.17	0.0	3.925	1.00	4.80	-1.481	0.97
							NON-linear form	18.72	0.144	0.995	NON-linear form	20.92	0.0	3.584				
MW (g/mol)	# CF_2/3	PFNA	250.33	5.15	2.49	0.051	linear form	2.43	0.095	0.998	linear form	2.64	0.1	0.488	0.99	0.52	-0.138	0.97
							NON-linear form	2.45	0.116	0.997	NON-linear form	2.75	0.1	0.388				
414.1	7	PFOA	220.67	7.97	2.20	0.080	linear form	2.25	0.097	0.997	linear form	2.37	0.1	0.323	0.99	0.49	-0.249	0.96
							NON-linear form	2.19	0.100	0.993	NON-linear form	2.49	0.0	0.289				
364.1	6	PFHpA	201.90	10.25	2.01	0.102	linear form	1.89	0.095	0.996	linear form	2.12	0.1	0.405	1.00	0.46	-0.143	0.98
							NON-linear form	1.96	0.128	0.997	NON-linear form	2.18	0.1	0.283				
314.1	5	PFHxA	200.83	6.26	2.00	0.063	linear form	2.07	0.104	0.999	linear form	2.29	0.0	0.183	0.87	0.43	-0.211	0.94
							NON-linear form	2.01	0.097	0.997	NON-linear form	2.30	0.0	0.252				
330.0	5	HFPO-DA	250.21	8.23	2.50	0.082	linear form	2.42	0.100	0.995	linear form	2.79	0.1	0.455	0.83	0.58	-0.175	0.96
							NON-linear form	2.44	0.132	0.996	NON-linear form	2.73	0.1	0.436				
264.1	4	PFPeA	235.82	8.71	2.34	0.087	linear form	2.31	0.108	0.998	linear form	2.80	0.0	0.331	0.47	0.50	-0.148	0.94
							NON-linear form	2.33	0.115	0.993	NON-linear form	2.63	0.1	0.353				
214.1	3	PFBA	192.04	10.86	1.90	0.112	linear form	2.09	0.116	0.995	linear form	2.16	0.0	0.183	0.96	0.56	-0.438	0.97
							NON-linear form	1.91	0.107	0.983	NON-linear form	2.18	0.1	0.265				
164.1	2	PFPrA	228.51	18.14	2.27	0.181	linear form	2.18	0.125	0.900	linear form	2.42	0.1	0.387	0.98	0.65	-0.407	0.98
							NON-linear form	2.26	0.127	0.991	NON-linear form	2.58	0.1	0.348				
114.1	1	TFA	211.12	12.55	2.06	0.135	linear form	1.78	0.056	0.763	linear form	2.17	0.1	0.446	0.99	0.64	-0.225	0.96
							NON-linear form	2.01	0.203	0.983	NON-linear form	2.20	0.1	0.578				
500.1	8	PFOS	212.55	7.61	2.12	0.076	linear form	2.27	0.102	0.998	linear form	2.36	0.0	0.236	0.98	0.51	-0.355	0.96
							NON-linear form	2.13	0.095	0.991	NON-linear form	2.45	0.0	0.248				
450.1	7	PFHpS	166.84	8.27	1.66	0.083	linear form	1.60	0.098	0.992	linear form	1.72	0.1	0.437	0.99	0.38	-0.105	0.93
							NON-linear form	1.63	0.130	0.995	NON-linear form	1.83	0.1	0.278				
400.1	6	PFHxS	264.58	7.59	2.64	0.076	linear form	2.61	0.104	0.996	linear form	2.81	0.1	0.467	0.99	0.63	-0.245	0.97
							NON-linear form	2.60	0.123	0.993	NON-linear form	2.93	0.0	0.427				
428.2	6	6:2-FTS	202.62	15.58	2.01	0.156	linear form	1.87	0.104	0.994	linear form	2.09	0.1	0.504	0.99	0.47	-0.070	0.98
							NON-linear form	1.96	0.152	0.995	NON-linear form	2.17	0.1	0.410				
350.1	5	PFPeS	202.01	3.24	2.01	0.032	linear form	2.01	0.106	0.995	linear form	2.16	0.1	0.337	1.00	0.52	-0.237	0.98
							NON-linear form	1.98	0.127	0.996	NON-linear form	2.24	0.1	0.329				
300.1	4	PFBS	213.57	11.40	2.13	0.114	linear form	1.92	0.108	0.984	linear form	2.20	0.1	0.622	1.00	0.54	-0.074	0.95
							NON-linear form	2.07	0.178	0.990	NON-linear form	2.28	0.1	0.503				
250.1	3	PFPrS	230.46	7.64	2.30	0.075	linear form	2.19	0.117	0.992	linear form	2.37	0.1	0.733	1.00	0.62	-0.183	0.97
							NON-linear form	2.25	0.162	0.992	NON-linear form	2.50	0.1	0.491				
200.1	2	PFEtS	225.72	7.48	2.25	0.074	linear form	2.14	0.117	0.992	linear form	2.32	0.1	0.718	1.00	0.60	-0.180	0.97
							NON-linear form	2.21	0.162	0.992	NON-linear form	2.45	0.1	0.481				
150.1	1	TFMS	198.83	3.47	1.96	0.035	linear form	1.75	0.138	0.993	linear form	2.01	0.2	0.966	1.00	0.53	-0.033	0.96
							NON-linear form	1.93	0.211	0.992	NON-linear form	2.10	0.1	0.572				

Figure S.10A Surface-Modified Clay – Adsorption kinetics for PFSAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

Surface-Modified Clay

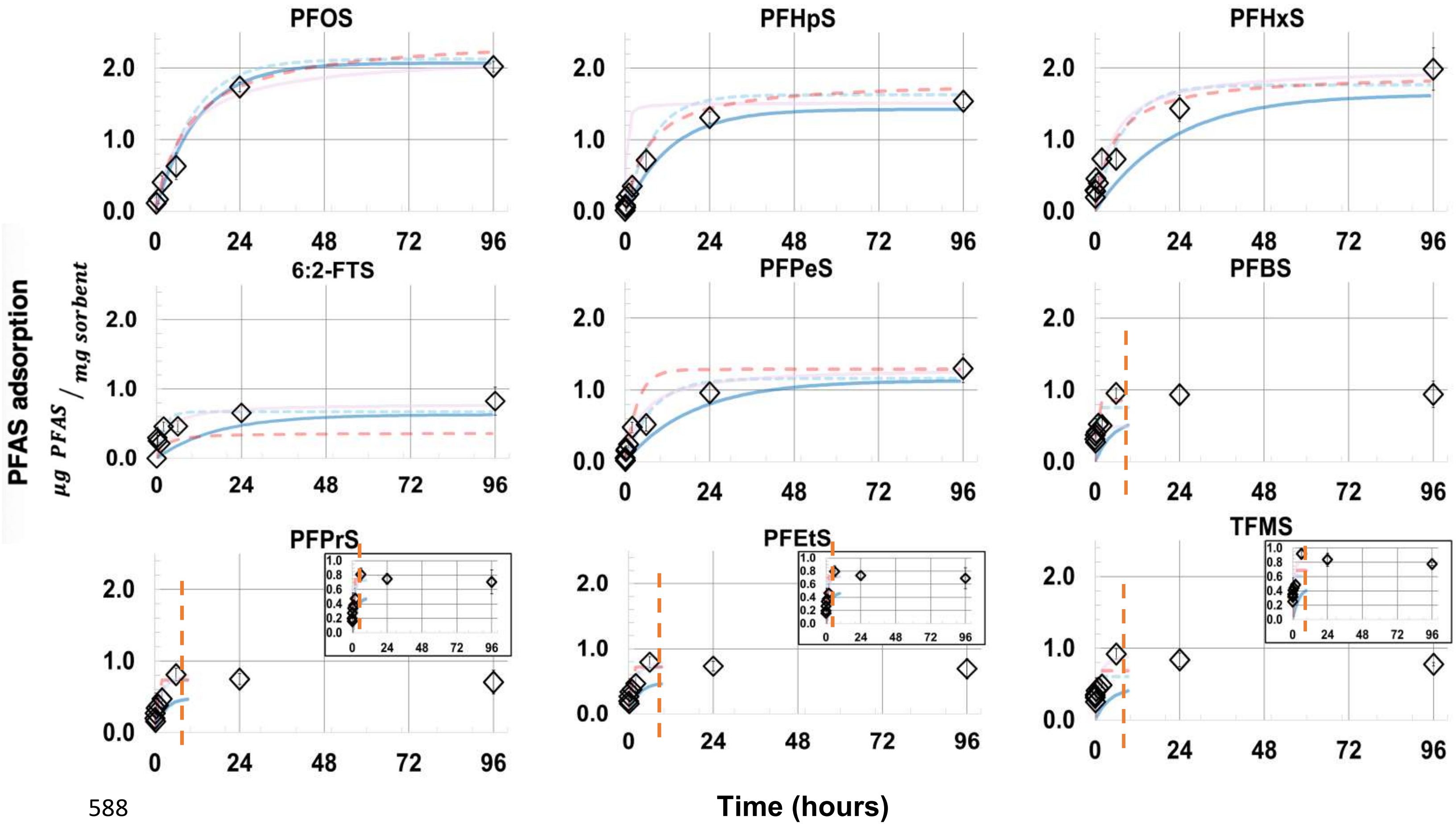


Figure S.10B Surface-Modified Clay – Adsorption kinetics for PFCAs

Adsorption capacity vs equilibration time (in hours). Blue lines are models fit to the PFO model; and Red lines are the models fit to the PSO model. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system (**Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL polypropylene test tube. Sacrificial data points collected after 1 min, 5 min, 10 min, 20 min, 1 hour, 2 hours, 6 hours, 24 hours, and 96 hours of equilibration, rotated at 40 rpm, room temperature. Vertical dashed line indicates the latest data point to which the kinetics models were fit prior to apparent de-sorption of the analyte.

Surface-Modified Clay

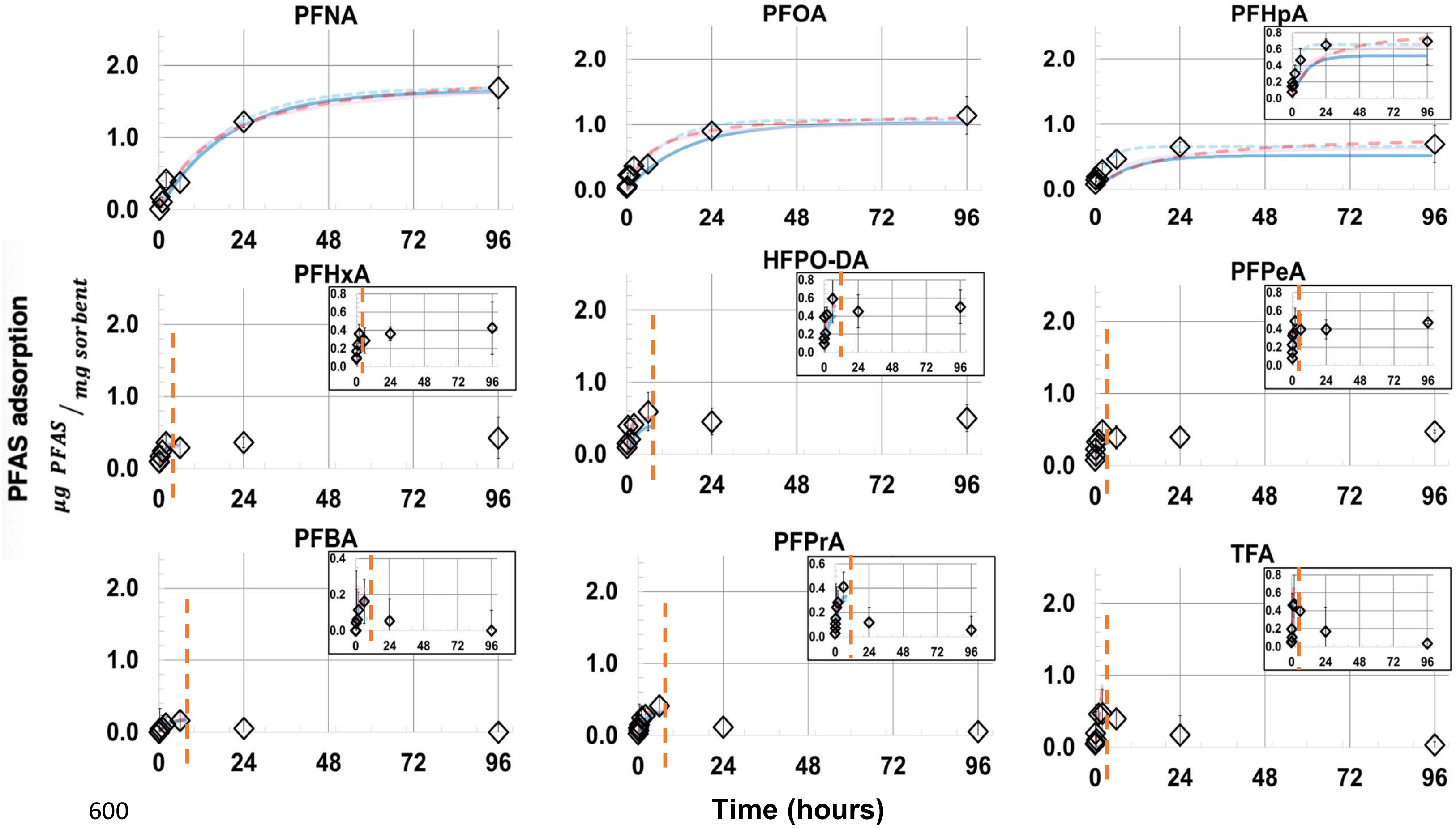


Figure S.10C. Surface-Modified Clay - PSO kinetic model parameter v0 (μg PFAS / mg sorbent / hour), which is interpreted as the second-order initial adsorption velocity, plotted against the MW of the PFAS analytes in this study **(Table S.1)**. Filled symbols represent 6:2-FTS and HFPO-DA.

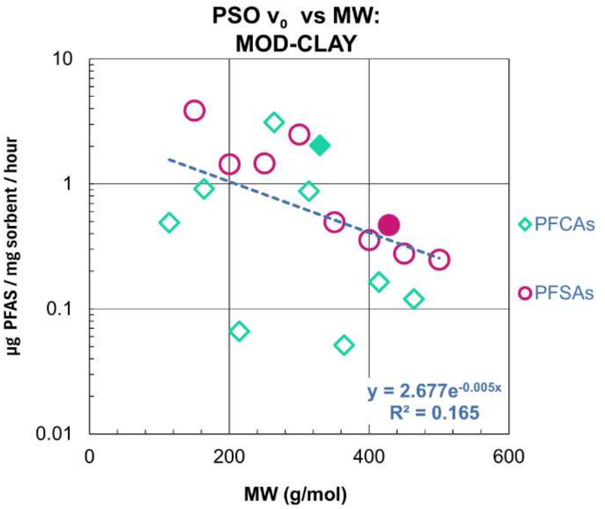


Table S.13 Surface-Modified Clay – Adsorption Kinetics Data and Model Parameters Summary

																Intraparticle Diffusion Model Linear		
																slope	intercept	
[redacted]	[redacted]	PFAS	CONTROL (C$_0$ [μg / L])	st dev	q_max [μg PFAS / mg sorbent]	st dev	PFO	q_e1 [μg PFAS / mg sorbent]	k_1 [1 / hours]	r^2	PSO	q_e2 [μg PFAS / mg sorbent]	k_2 [mg sorbent / μg PFAS*hour]	V$_0$ [ug PFAS / (mg sorbent* hour)]	r^2	k_IP [μg PFAS / mg sorbent*hour^0.5]	B_IP [mm]	r^2
[redacted]	[redacted]	SUM ALL 18 PFAS	3872.26	45.33	15.75	2.73	*linear form*	11.9	0.08	0.931	*linear form*	15.5	0.03	7.3	0.999	2.59	2.19	0.921
[redacted]	[redacted]	SUM PFCAs	1966.64	28.20	4.97	1.48	*linear form*	3.4	0.08	0.802	*linear form*	4.5	0.11	2.4	0.998	0.83	0.89	0.782
MW (g/mol)	# CF_2/3	SUM PFSAs	1905.62	20.12	10.78	1.25	*linear form*	9.1	0.13	0.961	*linear form*	10.8	0.05	5.5	0.998	1.76	1.29	0.962
							NON-linear form	9.5	0.24	0.968	*NON-linear form*	10.3	0.03	3.4	0.982			
464.1	8	PFNA	225.56	2.61	1.69	0.29	*linear form*	1.6	0.05	0.970	*linear form*	1.9	0.04	0.1	0.931	0.25	-0.07	0.947
							NON-linear form	1.7	0.05	0.973	*NON-linear form*	2.0	0.03	0.1	0.972			
414.1	7	PFOA	220.67	7.97	1.14	0.33	*linear form*	1.0	0.06	0.960	*linear form*	1.1	0.16	0.2	0.982	0.18	0.02	0.934
							NON-linear form	1.1	0.10	0.939	*NON-linear form*	1.2	0.12	0.2	0.949			
364.1	6	PFHpA	201.90	10.25	0.70	0.20	*linear form*	0.5	0.10	0.985	*linear form*	0.7	0.20	0.1	0.893	0.13	0.07	0.904
							NON-linear form	0.7	0.28	0.944	*NON-linear form*	0.9	0.07	0.1	0.885			
314.1	5	PFHxA	200.83	6.26	0.42	0.15	*linear form*	0.3	1.04	0.883	*linear form*	0.3	4.30	0.5	0.469	0.07	0.11	0.566
							NON-linear form	0.4	1.64	0.909	*NON-linear form*	0.4	6.05	0.9	0.929			
330.0	5	HFPO-DA	250.21	8.23	0.59	0.26	*linear form*	0.4	0.40	0.478	*linear form*	0.6	2.26	0.7	0.897	0.08	0.20	0.471
							NON-linear form	0.5	3.80	0.657	*NON-linear form*	0.5	7.31	2.0	0.742			
264.1	4	PFPeA	235.82	8.71	0.49	0.14	*linear form*	0.3	1.02	0.694	*linear form*	0.5	4.29	1.1	0.865	0.05	0.23	0.340
							NON-linear form	0.4	4.42	0.840	*NON-linear form*	0.4	16.21	3.1	0.850			
214.1	3	PFBA	192.04	10.86	0.16	0.12	*linear form*	0.2	0.61	0.966	*linear form*	0.2	-27.74	-1.4	0.916	0.02	0.03	0.210
							NON-linear form	0.1	1.11	0.397	*NON-linear form*	0.3	0.77	0.1	0.065			
164.1	2	PFPrA	228.51	18.14	0.41	0.05	*linear form*	0.3	0.52	0.913	*linear form*	0.4	5.05	0.8	0.807	0.02	0.14	0.083
							NON-linear form	0.3	2.46	0.348	*NON-linear form*	0.4	7.10	0.9	0.264			
114.1	1	TFA	211.12	12.55	0.47	0.33	*linear form*	0.3	-0.06	0.001	*linear form*	0.3	-17.71	-1.2	0.976	0.02	0.21	0.043
							NON-linear form	6.3	0.07	0.036	*NON-linear form*	5.6	0.02	0.5	0.027			
500.1	8	PFOS	212.55	7.61	2.02	0.07	*linear form*	2.1	0.08	0.993	*linear form*	2.2	0.06	0.3	0.975	0.38	-0.19	0.989
							NON-linear form	2.1	0.09	0.986	*NON-linear form*	2.5	0.04	0.2	0.984			
450.1	7	PFHpS	166.84	8.27	1.54	0.09	*linear form*	1.4	0.08	0.994	*linear form*	1.5	3.47	7.9	0.938	0.27	-0.01	0.993
							NON-linear form	1.6	0.13	0.987	*NON-linear form*	1.8	0.08	0.3	0.992			
400.1	6	PFHxS	264.58	7.59	1.98	0.30	*linear form*	1.6	0.05	0.956	*linear form*	2.0	0.10	0.4	0.987	0.25	0.22	0.945
							NON-linear form	1.8	0.13	0.913	*NON-linear form*	1.9	0.10	0.4	0.924			
428.2	6	6:2-FTS	191.07	10.94	0.82	0.20	*linear form*	0.6	0.06	0.749	*linear form*	0.8	0.43	0.3	0.996	0.13	0.08	0.651
							NON-linear form	0.7	0.50	0.772	*NON-linear form*	0.7	0.87	0.5	0.815			
350.1	5	PFPeS	202.01	3.24	1.30	0.20	*linear form*	1.1	0.05	0.942	*linear form*	1.3	0.15	0.3	0.991	0.19	0.06	0.951
							NON-linear form	1.2	0.13	0.936	*NON-linear form*	1.3	0.30	0.5	0.914			
300.1	4	PFBS	213.57	11.40	0.95	0.07	*linear form*	0.6	0.20	0.677	*linear form*	0.5	24.03	5.9	0.988	0.15	0.33	0.798
							NON-linear form	0.8	2.65	0.618	*NON-linear form*	0.9	3.41	2.5	0.749			
250.1	3	PFPrS	230.46	7.64	0.81	0.09	*linear form*	0.5	0.38	0.861	*linear form*	0.9	0.97	0.8	0.892	0.13	0.24	0.743
							NON-linear form	0.7	0.92	0.876	*NON-linear form*	0.7	2.70	1.5	0.843			
200.1	2	PFEtS	225.72	7.48	0.80	0.09	*linear form*	0.5	0.38	0.861	*linear form*	0.9	0.99	0.8	0.892	0.13	0.24	0.743
							NON-linear form	0.7	0.92	0.876	*NON-linear form*	0.7	2.76	1.4	0.843			
150.1	1	TFMS	198.83	3.47	0.92	0.07	*linear form*	0.5	0.24	0.748	*linear form*	0.9	1.60	1.4	0.908	0.13	0.32	0.739
							NON-linear form	0.6	4.92	0.463	*NON-linear form*	0.7	8.21	3.9	0.605			

Figure S.11A Calgon F400 GAC – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

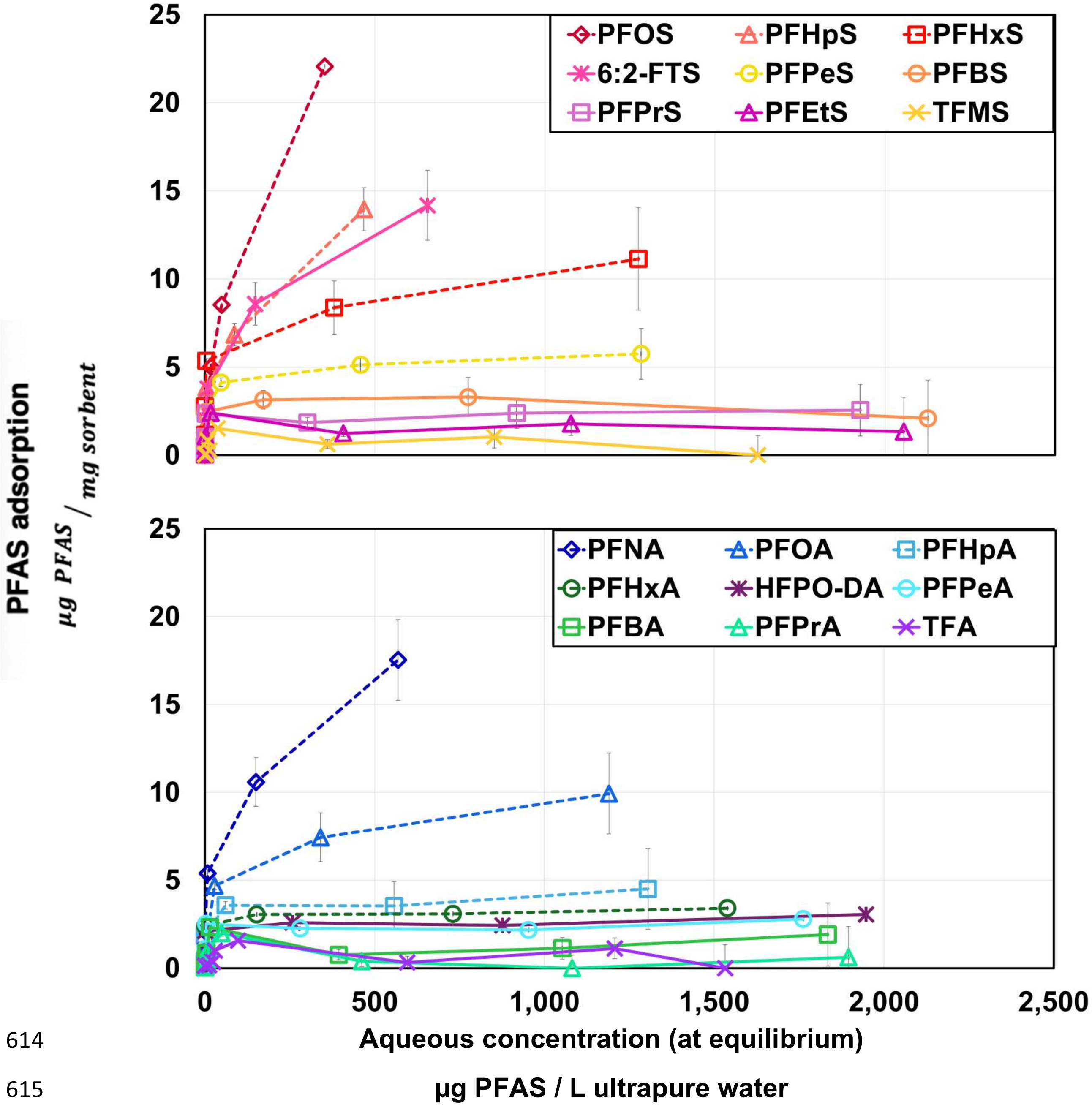


Figure S.11B Calgon F400 GAC – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

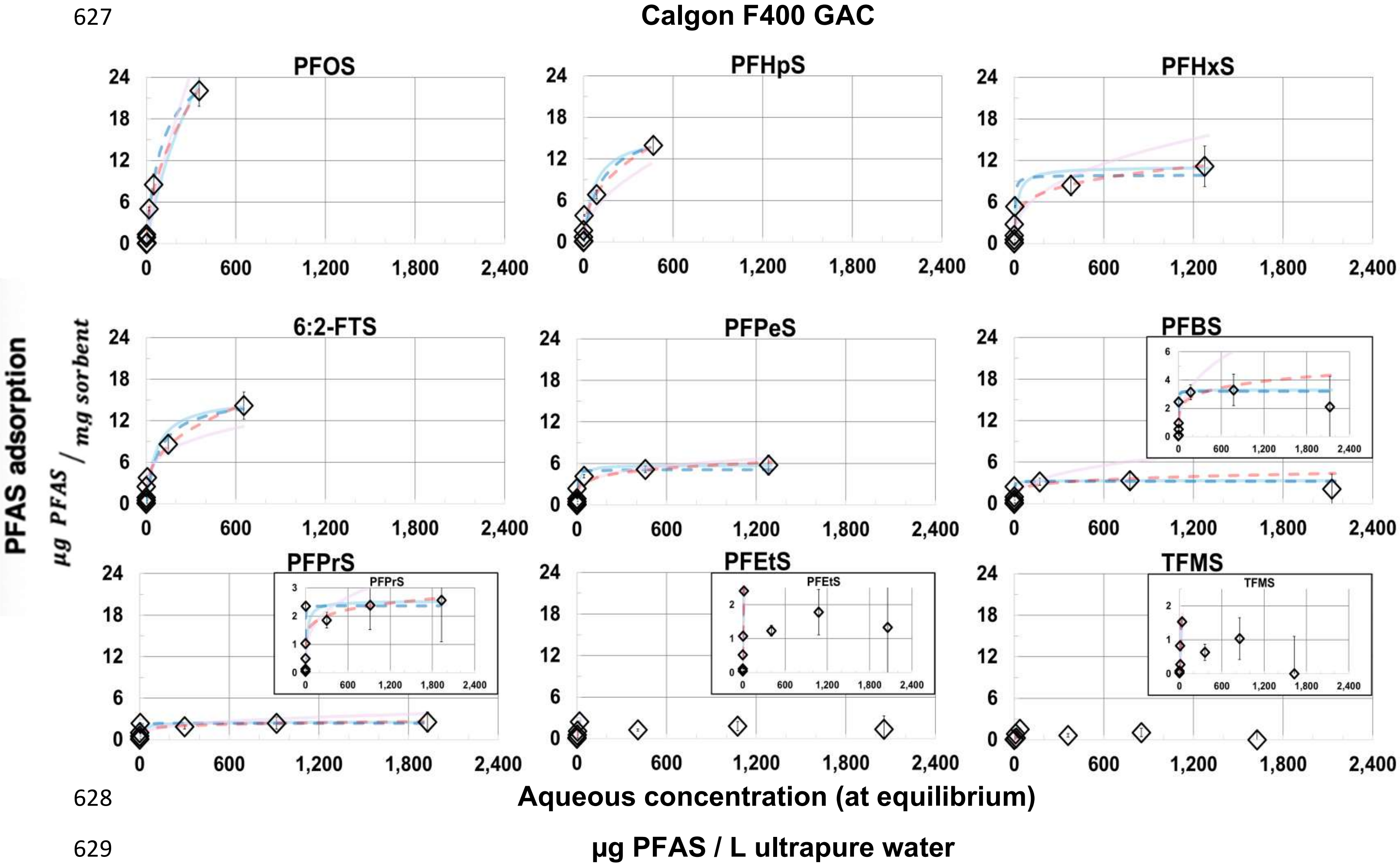
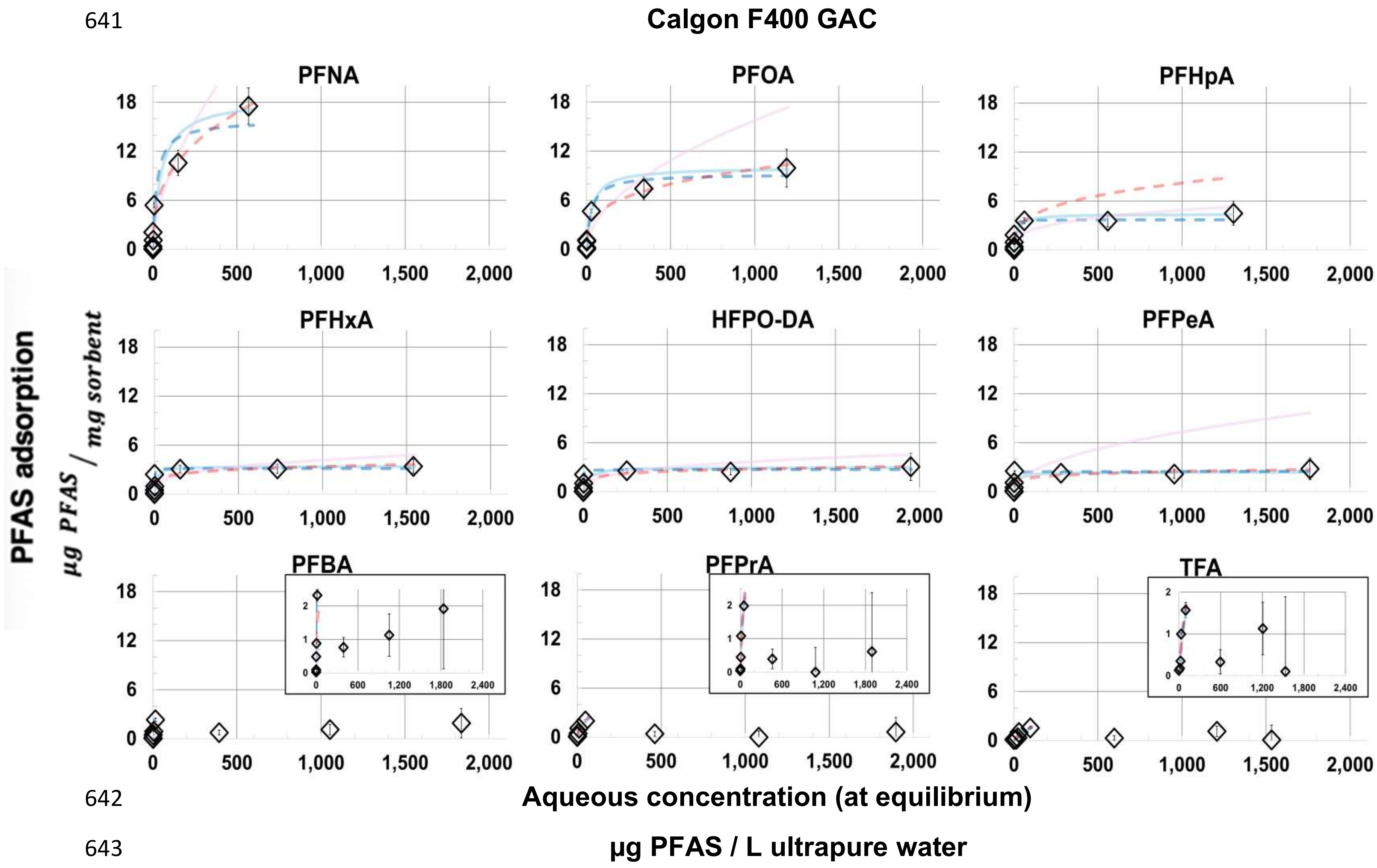


Figure S.11C Calgon F400 GAC – Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.



Calgon F400 GAC

18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		PFAS	q_{max}			Langmuir	[L / ug PFAS]	[µg PFAS / mg sorbent]	Freundlich	(µg PFAS / mg sorbent) * (L / µg)^(1/n)	-
			[µg PFAS / mg sorbent]	[µmol PFAS / mg sorbent]		r^2	K_L	q_{max}	r^2	K_F	$\frac{1}{n}$
		Σ PFCAs	42.16	0.085	*linear*	0.97	1.5E-03	41.3	0.84	0.52	0.50
					non-linear	0.90	5.1E-03	34.2	0.94	2.24	0.31
		Σ PFSAs	73.09	0.176	*linear*	0.94	1.4E-03	72.0	0.85	0.69	0.53
					non-linear	0.94	3.1E-04	88.9	0.97	2.12	0.37
MW (g/mol)	# CF(2/3)	Σ All PFAS	115.26	0.262	*linear*	0.95	6.4E-04	112.9	0.86	0.76	0.53
					non-linear	0.86	1.9E-03	89.6	0.96	3.12	0.35
464	8	PFNA	17.5	0.0378	*linear*	0.94	0.020	18.6	0.69	0.619	0.58
					non-linear	0.93	0.042	15.8	0.97	1.694	0.37
414	7	PFOA	9.9	0.0214	*linear*	0.99	0.031	10.0	0.81	0.392	0.53
					non-linear	0.97	0.035	9.2	0.97	1.259	0.30
364	6	PFHpA	4.5	0.0124	*linear*	0.99	0.058	4.4	0.56	0.603	0.30
					non-linear	0.86	0.358	3.7	0.80	1.034	0.30
314	5	PFHxA	3.4	0.0074	*linear*	1.00	0.092	3.4	0.57	0.498	0.31
					non-linear	0.79	0.986	3.2	0.74	1.076	0.17
330	5	HFPO-DA	3.1	0.0066	*linear*	0.99	0.042	3.0	0.68	0.420	0.31
					non-linear	0.88	0.807	2.7	0.77	0.931	0.16
264	4	PFPeA	2.8	0.0060	*linear*	0.96	0.058	2.4	0.39	0.256	0.49
					non-linear	0.73	0.340	2.5	0.58	0.798	0.17
214	3	PFBA	2.3	0.0050	*linear*	1.00	0.354	0.8	0.39	0.213	0.37
					non-linear	0.56	0.844	2.7	0.29	0.920	0.19
164	2	PFPrA	2.0	0.0121	*linear*	0.26	0.020	4.0	0.87	0.131	0.67
					non-linear	0.01	0.035	3.1	0.03	0.175	0.63
114	1	TFA	1.6	0.0138	*linear*	0.17	0.009	3.1	0.60	0.209	0.31
					non-linear	0.02	0.008	3.7	0.00	0.052	0.75
500	8	PFOS	22.1	0.0441	*linear*	0.04	0.002	55.2	0.70	0.297	0.78
					non-linear	0.99	0.009	28.7	0.99	0.989	0.53
450	7	PFHpS	14.0	0.0310	*linear*	0.85	0.014	15.8	0.51	0.558	0.49
					non-linear	0.94	0.009	17.2	0.95	1.146	0.41
400	6	PFHxS	11.1	0.0278	*linear*	0.99	0.052	11.0	0.58	0.949	0.39
					non-linear	0.92	0.268	9.9	0.90	2.203	0.23
428	6	6:2-FTS	14.2	0.0331	*linear*	0.90	0.015	15.4	0.68	2.098	0.26
					non-linear	0.95	0.011	15.6	0.95	1.367	0.36
350	5	PFPeS	5.8	0.0164	*linear*	1.00	0.098	5.7	0.75	1.288	0.23
					non-linear	0.93	0.796	5.1	0.89	1.557	0.19
300	4	PFBS	3.3	0.0110	*linear*	1.00	0.310	3.3	0.67	0.507	0.37
					non-linear	0.85	0.942	3.2	0.75	1.097	0.18
250	3	PFPrS	2.6	0.0102	*linear*	1.00	0.047	2.5	0.63	0.413	0.29
					non-linear	0.90	0.965	2.4	0.68	0.891	0.14
200	2	PFEtS	2.4	0.0120	*linear*	0.52	0.103	3.8	0.87	0.390	0.57
					non-linear	0.99	0.125	3.6	0.97	0.444	0.60
150	1	TFMS	1.5	0.0102	*linear*	0.04	0.008	5.5	0.79	0.044	0.97
					non-linear	0.84	0.007	7.7	0.84	0.069	0.85

Table S.14 Calgon F400 GAC – Adsorption Capacity and Isotherm Model Parameters Summary

Figure S.12A Norit 1240+ GAC – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

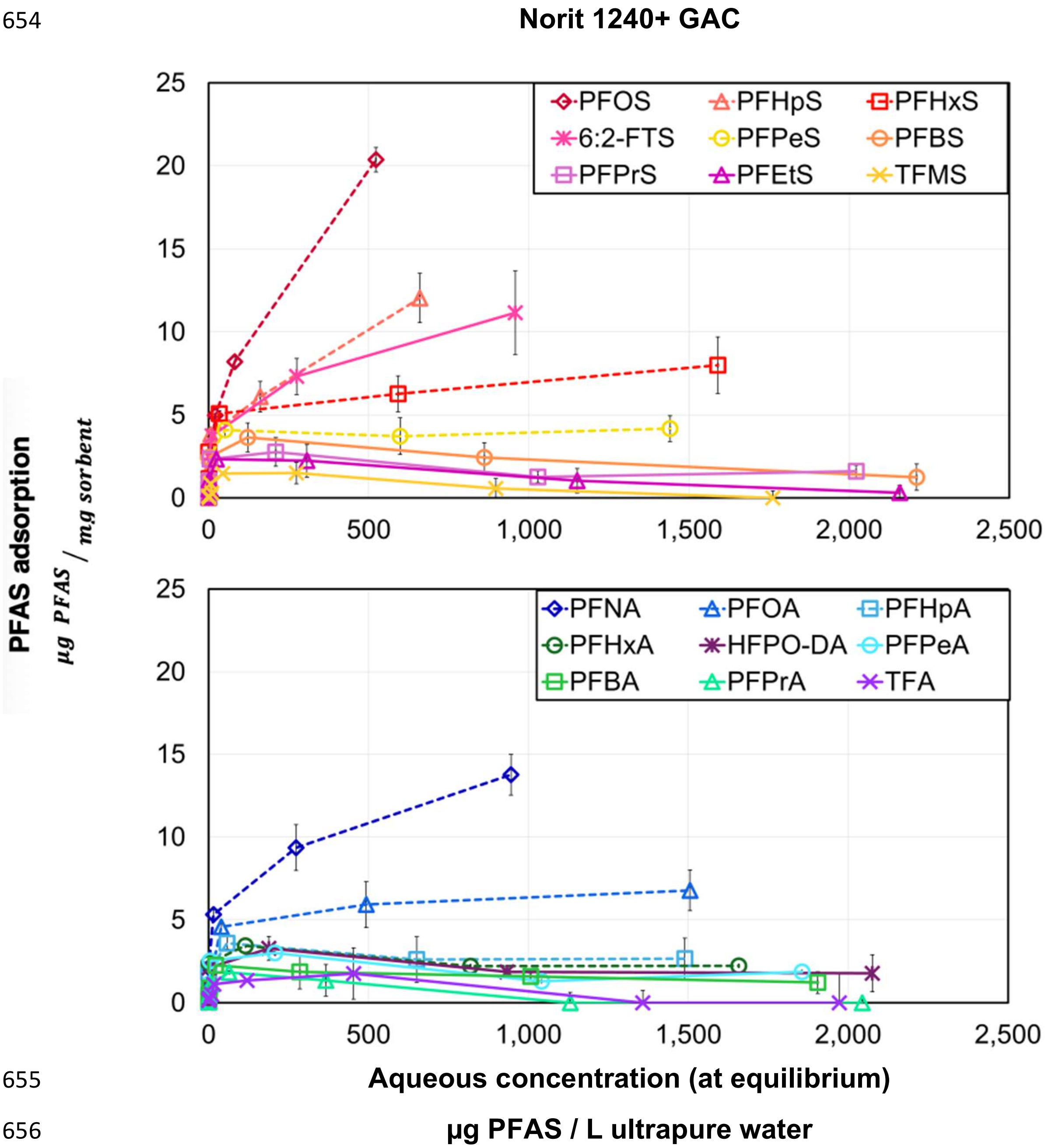


Figure S.12B Norit 1240+ GAC – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

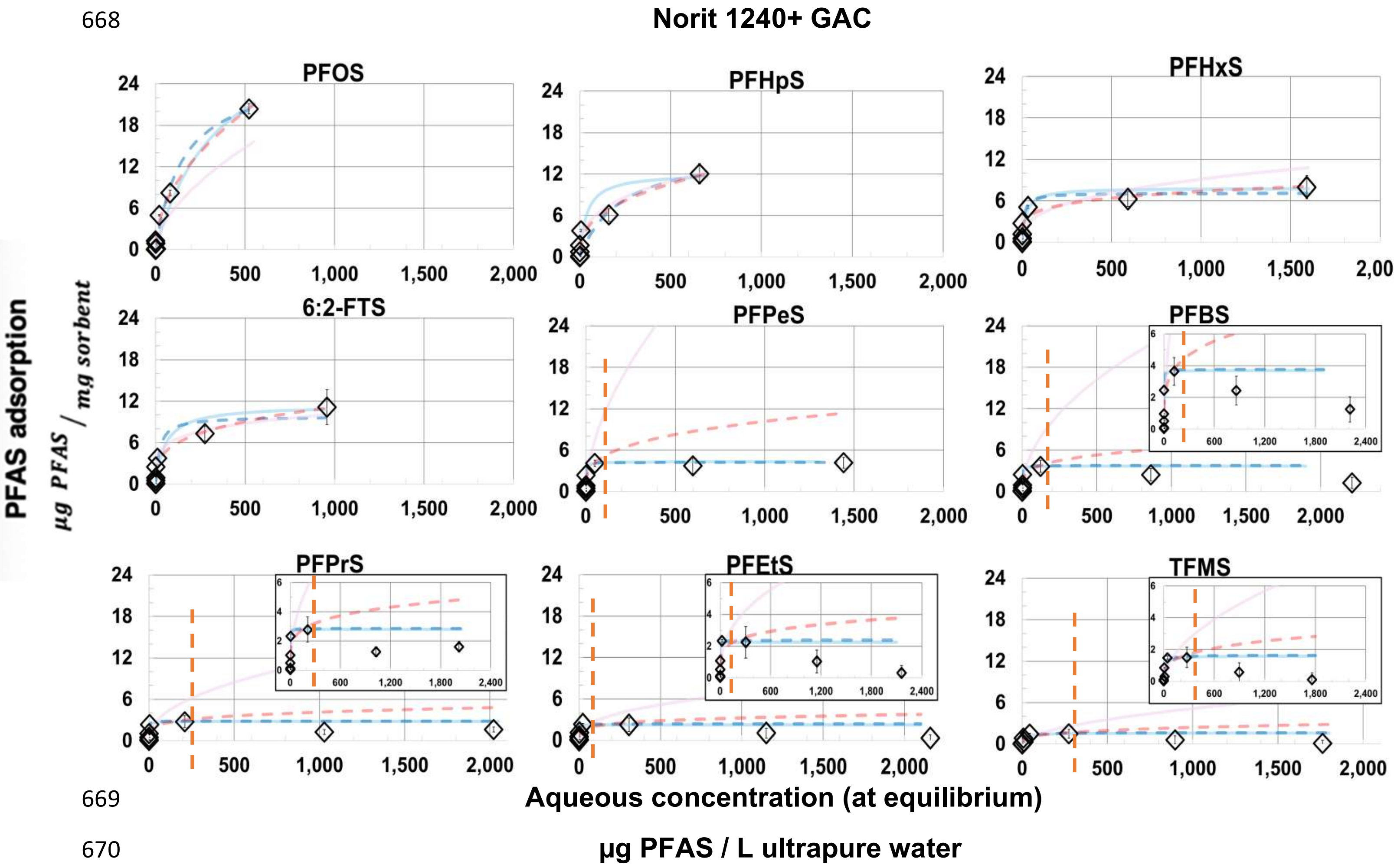


Figure S.12C Norit 1240+ GAC – Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity q_e $[(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

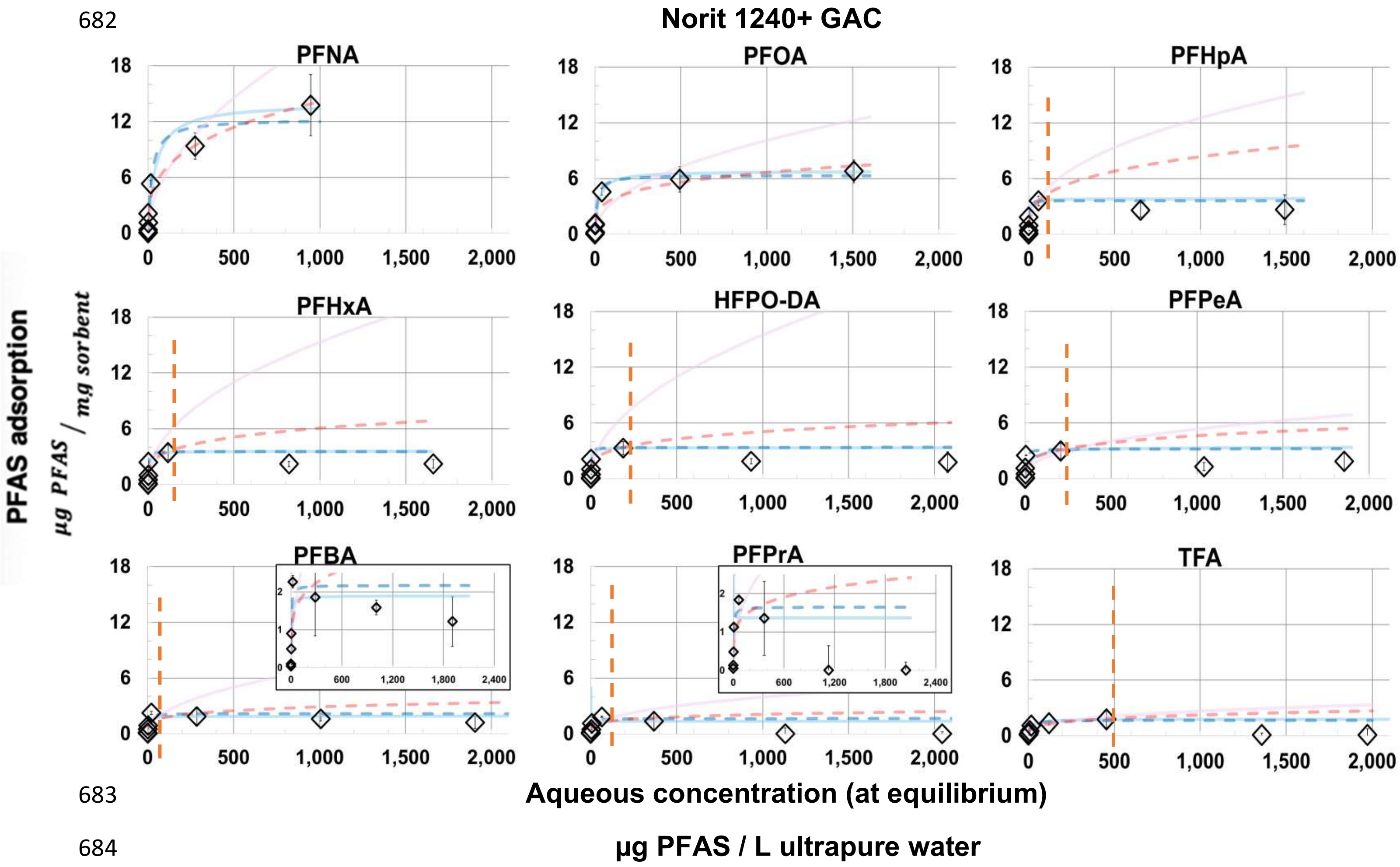


Table S.15 Norit 1240+ GAC – Adsorption Capacity and Isotherm Model Parameters

Norit 1240+ GAC											
18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		PFAS	q_{max}			**Langmuir**	**[L / ug PFAS]**	**[µg PFAS / mg sorbent]**	**Freundlich**	**(µg PFAS / mg sorbent) * (L / µg)^(1/n)**	**-**
			[µg PFAS / mg sorbent]	**[µmol PFAS / mg sorbent]**		r^2	K_L	q_{max}	r^2	K_F	$\frac{1}{n}$
		Σ PFCAs	28.23	0.080	*linear*	1.00	8.4E-03	30.1	0.88	0.88	0.41
					non-linear	0.98	1.0E-02	28.8	0.95	2.23	0.35
		Σ PFSAs	57.54	0.129	*linear*	0.96	2.0E-03	55.4	0.82	0.85	0.49
					non-linear	0.89	7.9E-03	44.9	0.93	2.12	0.37
MW (g/mol)	# CF(2/3)	Σ All PFAS	80.95	0.176	*linear*	0.98	1.5E-03	78.6	0.83	1.17	0.46
					non-linear	0.96	5.8E-03	63.0	0.92	6.80	0.24
464	8	PFNA	13.8	0.0297	*linear*	0.98	0.023	14.0	0.68	0.563	0.52
					non-linear	0.94	0.047	12.3	0.96	1.624	0.31
414	7	PFOA	6.8	0.0146	*linear*	1.00	0.049	6.8	0.77	0.377	0.48
					non-linear	0.98	0.088	6.4	0.92	1.221	0.25
364	6	PFHpA	3.6	0.0099	*linear*	0.97	0.261	3.8	0.42	0.690	0.42
					non-linear	0.76	0.788	3.6	0.78	1.091	0.29
314	5	PFHxA	3.4	0.0074	*linear*	0.99	0.217	3.6	0.51	0.570	0.48
					non-linear	0.77	1.311	2.7	0.72	1.079	0.25
330	5	HFPO-DA	3.3	0.0071	*linear*	1.00	0.302	3.3	0.74	0.495	0.50
					non-linear	0.95	0.541	3.4	0.81	0.959	0.24
264	4	PFPeA	3.0	0.0065	*linear*	0.83	0.037	3.4	0.28	0.352	0.39
					non-linear	0.70	0.240	3.2	0.58	0.816	0.25
214	3	PFBA	2.3	0.0049	*linear*	0.38	0.083	3.6	0.99	0.465	0.53
					non-linear	0.97	0.038	6.3	0.98	0.424	0.55
164	2	PFPrA	1.8	0.0112	*linear*	0.99	0.231	2.0	0.85	0.406	0.38
					non-linear	0.90	0.035	3.1	0.87	0.175	0.63
114	1	TFA	1.8	0.0155	*linear*	0.99	0.134	1.4	0.83	0.230	0.41
					non-linear	0.70	0.008	3.7	0.69	0.051	0.75
500	8	PFOS	20.4	0.0407	*linear*	0.15	0.003	35.2	0.54	0.386	0.59
					non-linear	0.98	0.007	26.1	0.98	0.879	0.50
450	7	PFHpS	12.0	0.0268	*linear*	0.94	0.027	12.2	0.93	1.303	0.34
					non-linear	0.92	0.004	16.1	0.93	1.022	0.38
400	6	PFHxS	8.0	0.0200	*linear*	0.99	0.046	7.9	0.59	0.792	0.35
					non-linear	0.90	0.096	7.1	0.89	1.793	0.20
428	6	6:2-FTS	11.2	0.0261	*linear*	0.96	0.018	11.5	0.82	2.476	0.20
					non-linear	0.91	0.047	9.8	0.93	1.406	0.30
350	5	PFPeS	4.2	0.0119	*linear*	1.00	0.137	4.1	0.61	1.337	0.30
					non-linear	0.91	1.109	4.2	0.81	1.413	0.28
300	4	PFBS	3.6	0.0121	*linear*	1.00	0.560	3.7	0.80	0.680	0.51
					non-linear	0.87	1.034	3.1	0.80	1.177	0.24
250	3	PFPrS	2.8	0.0111	*linear*	1.00	0.817	3.0	0.87	0.928	0.92
					non-linear	0.99	0.841	2.9	0.75	0.977	0.21
200	2	PFEtS	2.3	0.0117	*linear*	0.99	0.526	2.5	0.94	0.558	0.51
					non-linear	0.95	0.125	3.6	0.93	0.444	0.60
150	1	TFMS	1.5	0.0100	*linear*	0.41	0.040	2.1	0.80	0.185	0.52
					non-linear	0.99	0.007	7.7	0.81	0.069	0.85

Summary

Figure S.12D. Comparison of ultrapure adsorption isotherms for the two evaluated GACs.

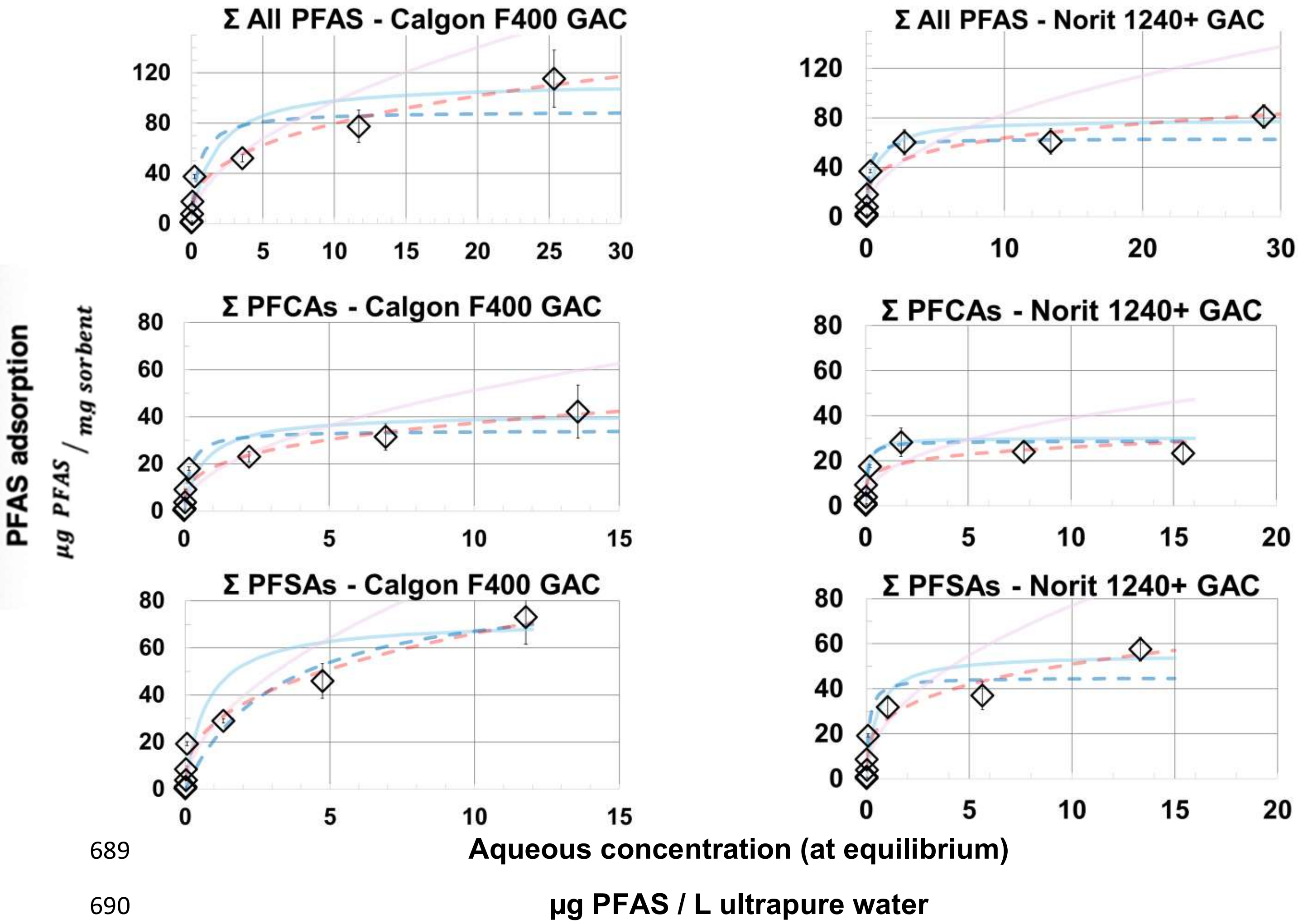


Figure S.13A DEXSORB – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

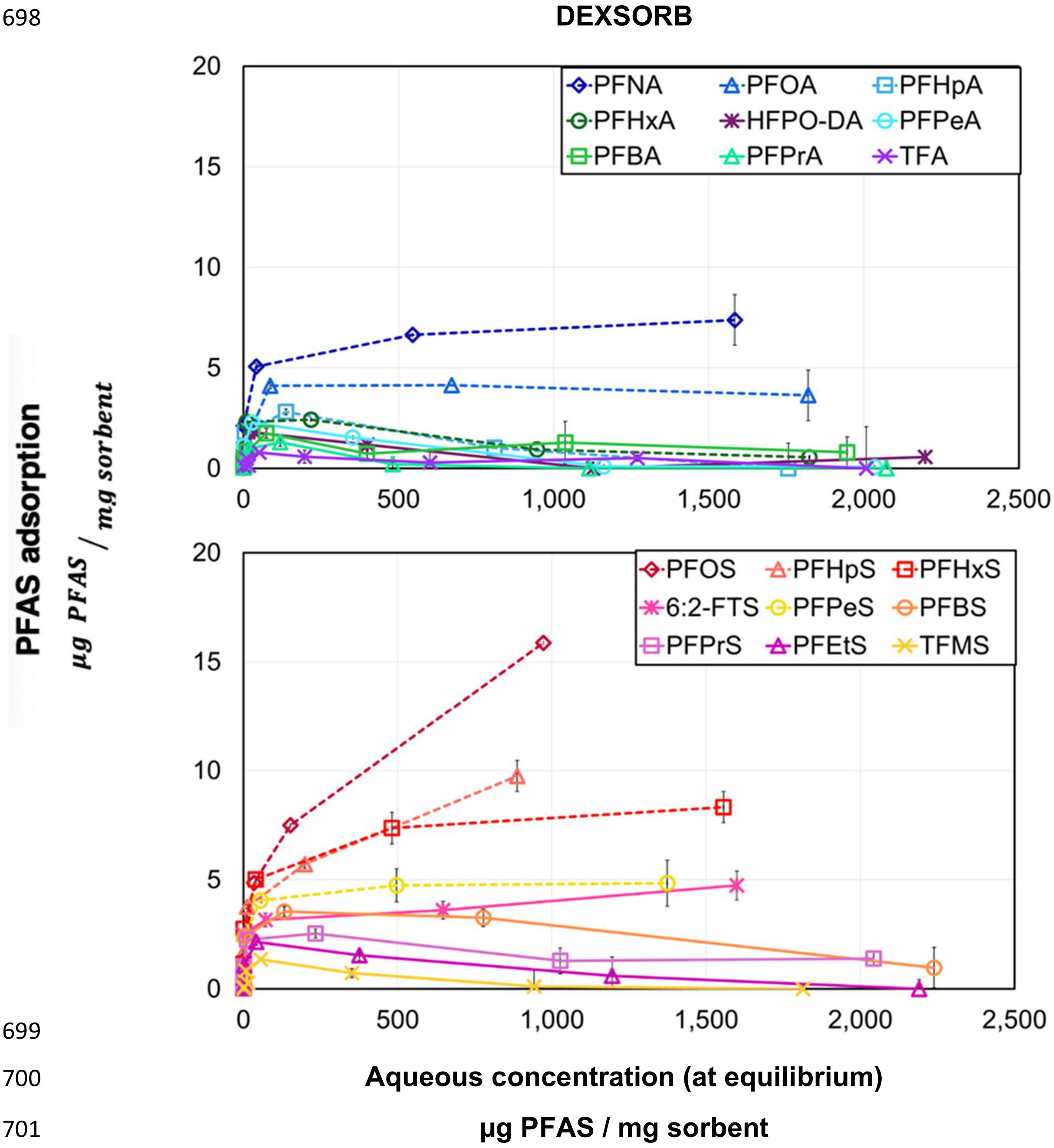


Figure S.13B DEXSORB – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

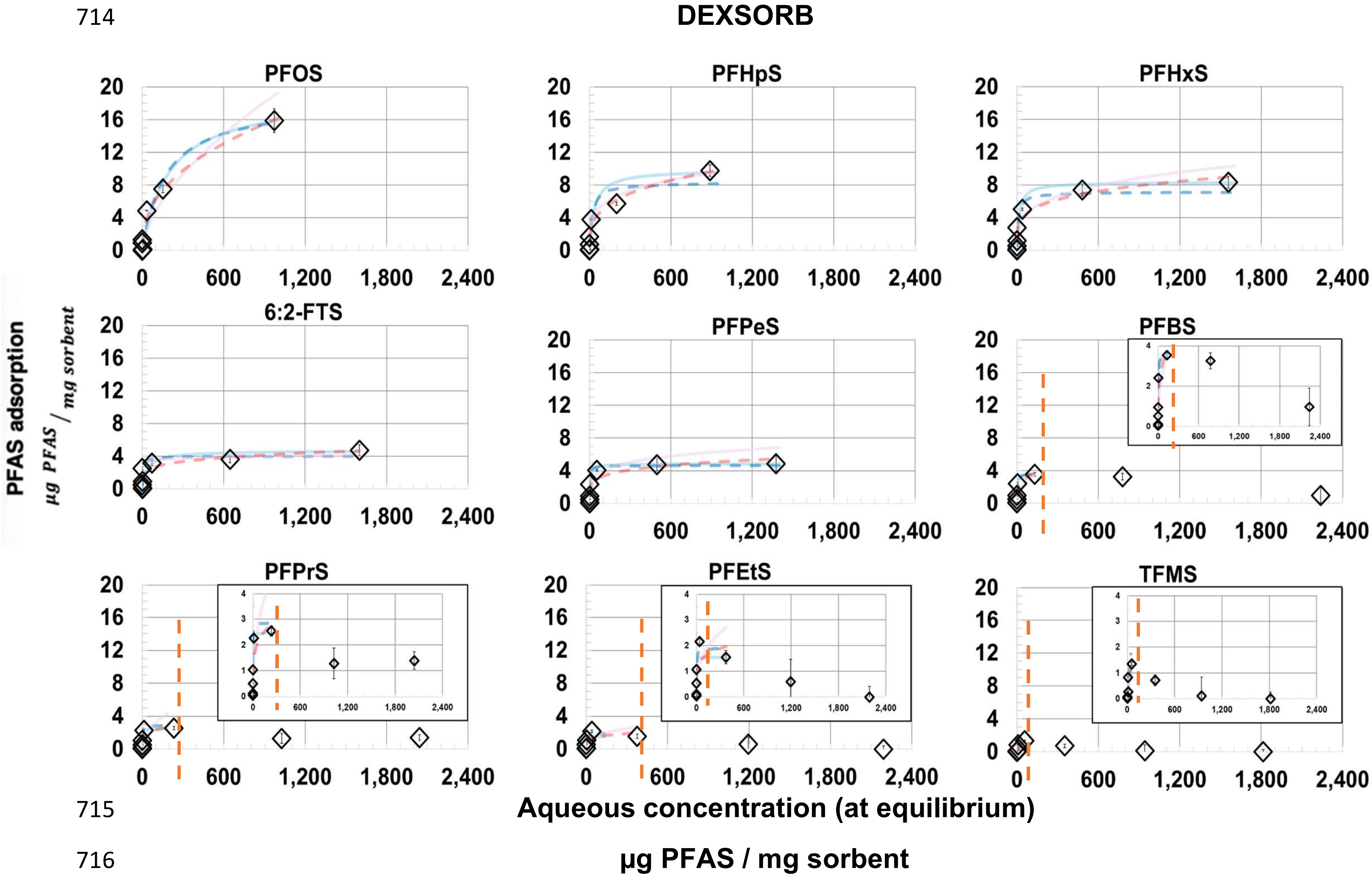


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Figure S.13C DEXSORB– Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

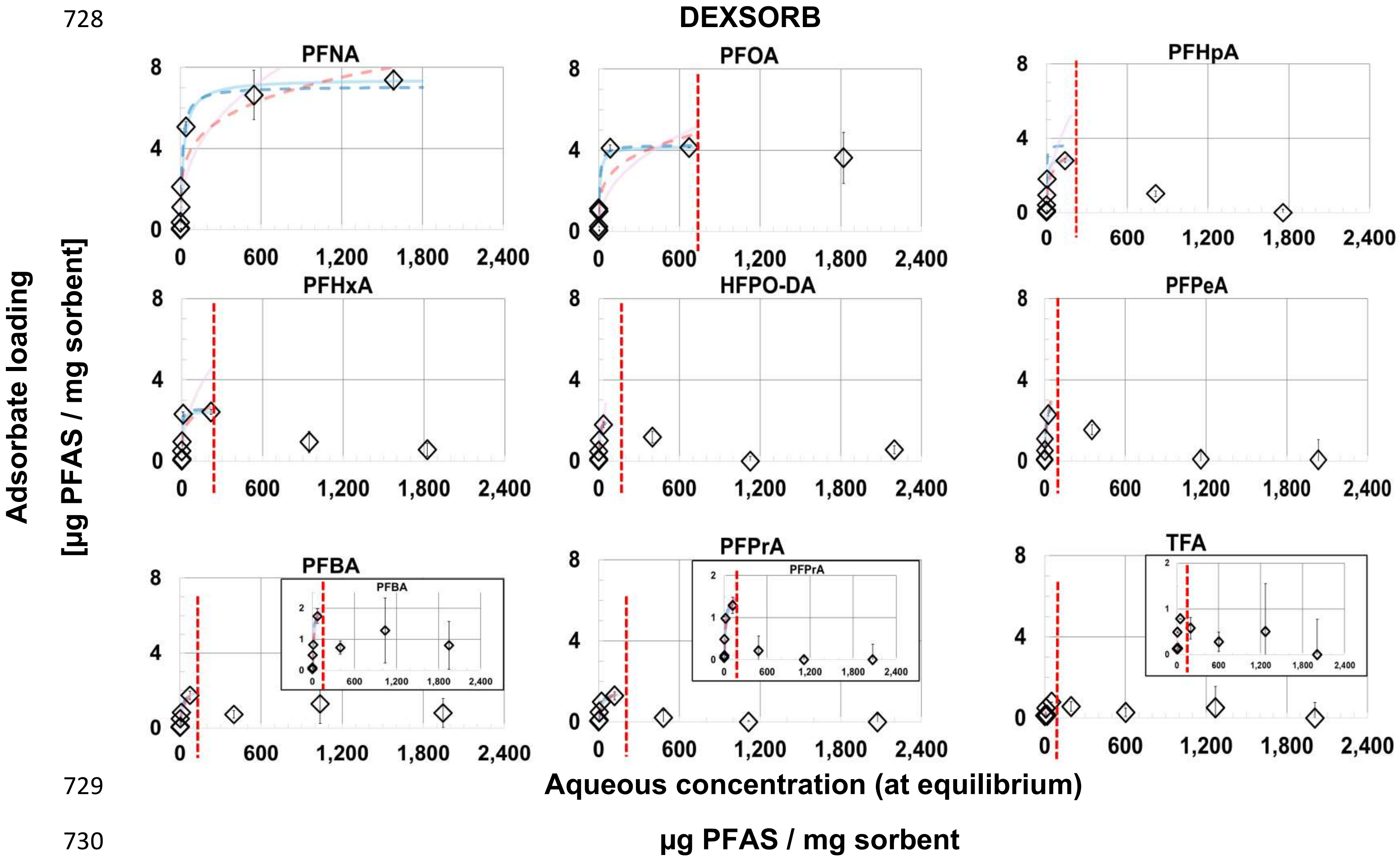


Table S.16 DEXSORB– Adsorption Capacity and Isotherm Model Parameters Summary

DEXSORB											
18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		**PFAS**	q_{max}			**Langmuir**	**[µg PFAS / mg sorbent]**	**[L / ug PFAS]**	**Freundlich**	**(µg PFAS / mg sorbent) * (L / µg)^(1/n)**	**-**
			[µg PFAS / mg sorbent]	**[µmol PFAS / mg sorbent]**		r^2	q_{max}	K_L	r^2	K_F	$\frac{1}{n}$
[redacted]		Σ PFCAs	18.34	0.044	*linear*	0.98	5.2E-03	19.7	0.75	0.56	0.43
					non-linear	0.97	7.7E-03	19.3	0.88	1.68	0.31
		Σ PFSAs	43.99	0.095	*linear*	0.99	2.7E-03	43.5	0.83	0.75	0.48
					non-linear	0.95	7.7E-03	37.7	0.94	3.79	0.26
MW (g/mol)	# $CF_{(2/3)}$	Σ All PFAS	49.44	0.128	*linear*	1.00	2.9E-03	49.9	0.81	0.90	0.45
					non-linear	0.99	4.0E-03	49.7	0.84	6.80	0.24
464	8	PFNA	7.4	0.0159	*linear*	1.00	0.042	7.4	0.72	0.415	0.47
					non-linear	0.95	0.072	7.1	0.90	1.419	0.24
414	7	PFOA	4.1	0.0089	*linear*	1.00	0.122	4.2	0.76	0.311	0.43
					non-linear	0.97	0.163	4.3	0.86	0.905	0.25
364	6	PFHpA	2.8	0.0077	*linear*	1.00	0.254	2.9	0.69	0.434	0.48
					non-linear	0.93	0.788	3.6	0.87	0.786	0.27
314	5	PFHxA	2.4	0.0052	*linear*	1.00	0.259	2.5	0.66	0.371	0.47
					non-linear	0.96	0.428	2.6	0.74	0.800	0.23
330	5	HFPO-DA	1.8	0.0038	*linear*	0.88	0.181	2.1	0.80	0.311	0.55
					non-linear	0.95	0.279	2.0	0.91	0.473	0.38
264	4	PFPeA	2.3	0.0049	*linear*	0.50	0.054	3.9	0.49	0.190	0.48
					non-linear	0.89	0.128	3.0	0.86	0.363	0.56
214	3	PFBA	1.7	0.0038	*linear*	0.94	0.067	2.1	0.99	0.391	0.34
					non-linear	0.96	0.077	2.0	0.96	0.262	0.44
164	2	PFPrA	1.3	0.0079	*linear*	0.84	0.049	1.5	0.95	0.373	0.28
					non-linear	0.91	0.080	1.5	0.85	0.246	0.36
114	1	TFA	0.8	0.0069	*linear*	0.90	0.070	0.6	0.22	0.162	0.27
					non-linear	0.52	0.098	0.7	0.46	0.218	0.22
550	8	PFOS	15.9	0.0317	*linear*	0.69	0.005	19.0	0.66	0.297	0.60
					non-linear	0.97	0.006	18.3	0.98	0.913	0.42
500	7	PFHpS	9.8	0.0217	*linear*	0.97	0.028	9.9	0.98	1.895	0.24
					non-linear	0.89	0.054	8.3	0.95	1.283	0.30
450	6	PFHxS	8.3	0.0208	*linear*	1.00	0.064	8.3	0.82	1.444	0.27
					non-linear	0.93	0.096	7.1	0.93	1.735	0.22
428	6	6:2-FTS	4.7	0.0111	*linear*	0.99	0.027	4.7	0.83	2.720	0.06
					non-linear	0.74	0.143	4.0	0.76	1.087	0.20
400	5	PFPeS	4.8	0.0138	*linear*	1.00	0.199	4.9	0.93	1.664	0.19
					non-linear	0.98	0.506	4.6	0.88	1.401	0.19
350	4	PFBS	3.5	0.0118	*linear*	1.00	0.329	3.6	0.81	0.457	0.42
					non-linear	0.99	0.379	3.5	0.88	0.985	0.27
300	3	PFPrS	2.5	0.0101	*linear*	1.00	0.868	2.5	0.71	0.427	0.44
					non-linear	0.97	0.841	2.9	0.80	0.841	0.22
250	2	PFEtS	2.2	0.0108	*linear*	0.90	0.188	2.4	0.78	0.432	0.41
					non-linear	0.94	0.257	2.4	0.92	0.555	0.37
200	1	TFMS	1.4	0.0090	*linear*	0.27	0.019	2.4	0.71	0.063	0.77
					non-linear	0.90	0.007	7.7	0.78	0.118	0.60

Figure S.14A Surface-modified clay – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

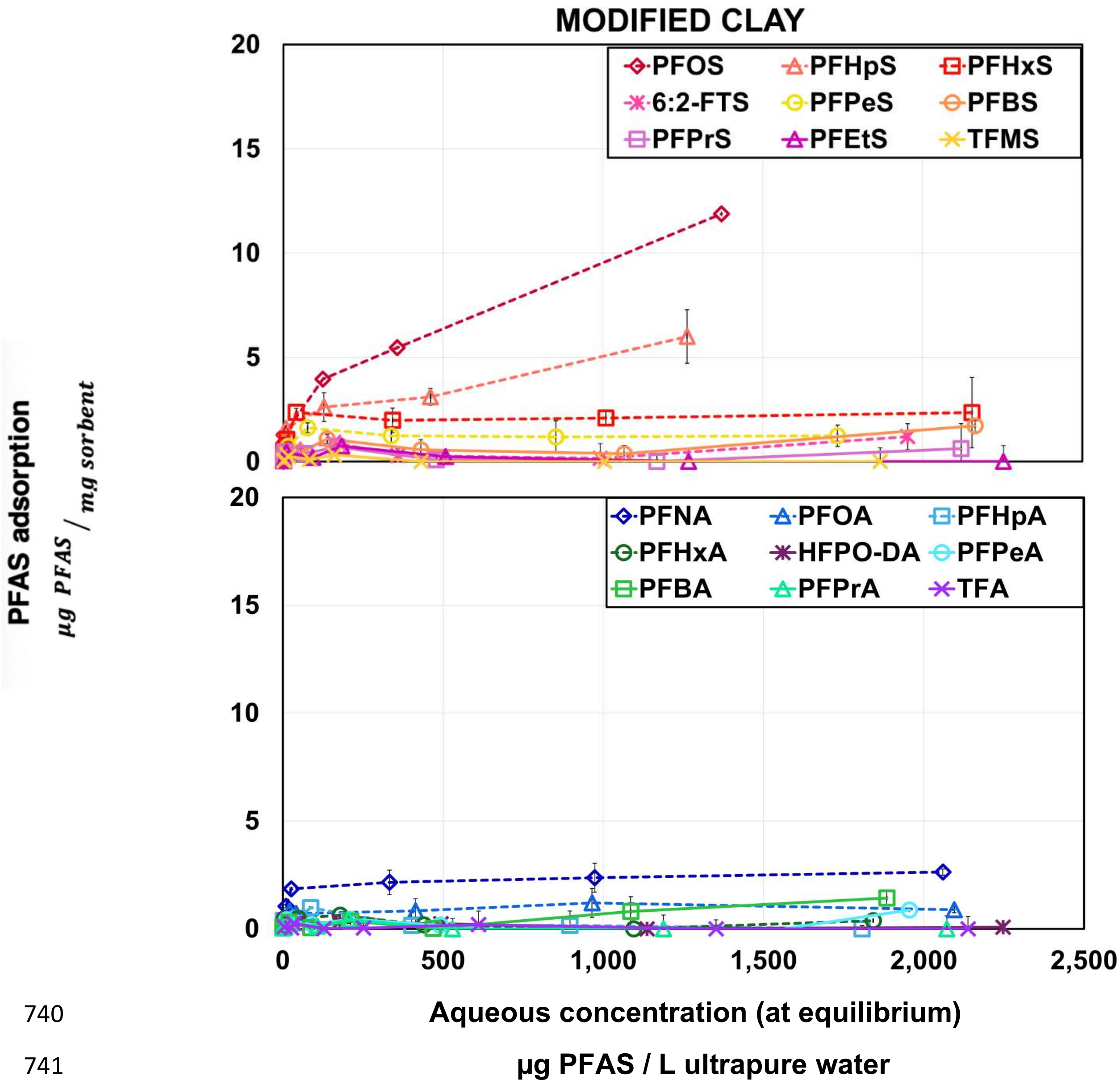


Figure S.14B Surface-modified clay – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

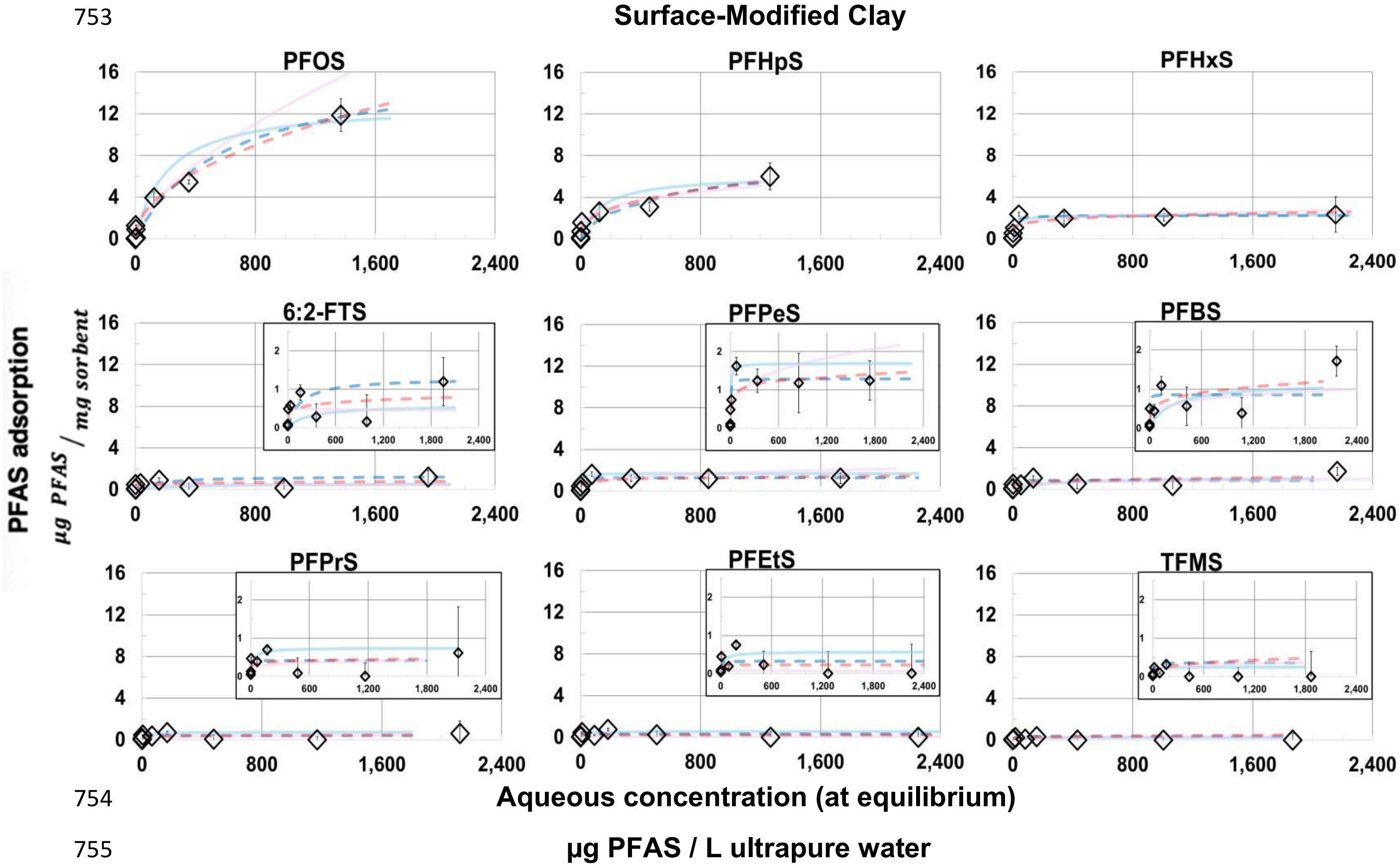


Figure S.14C Surface-modified clay– Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

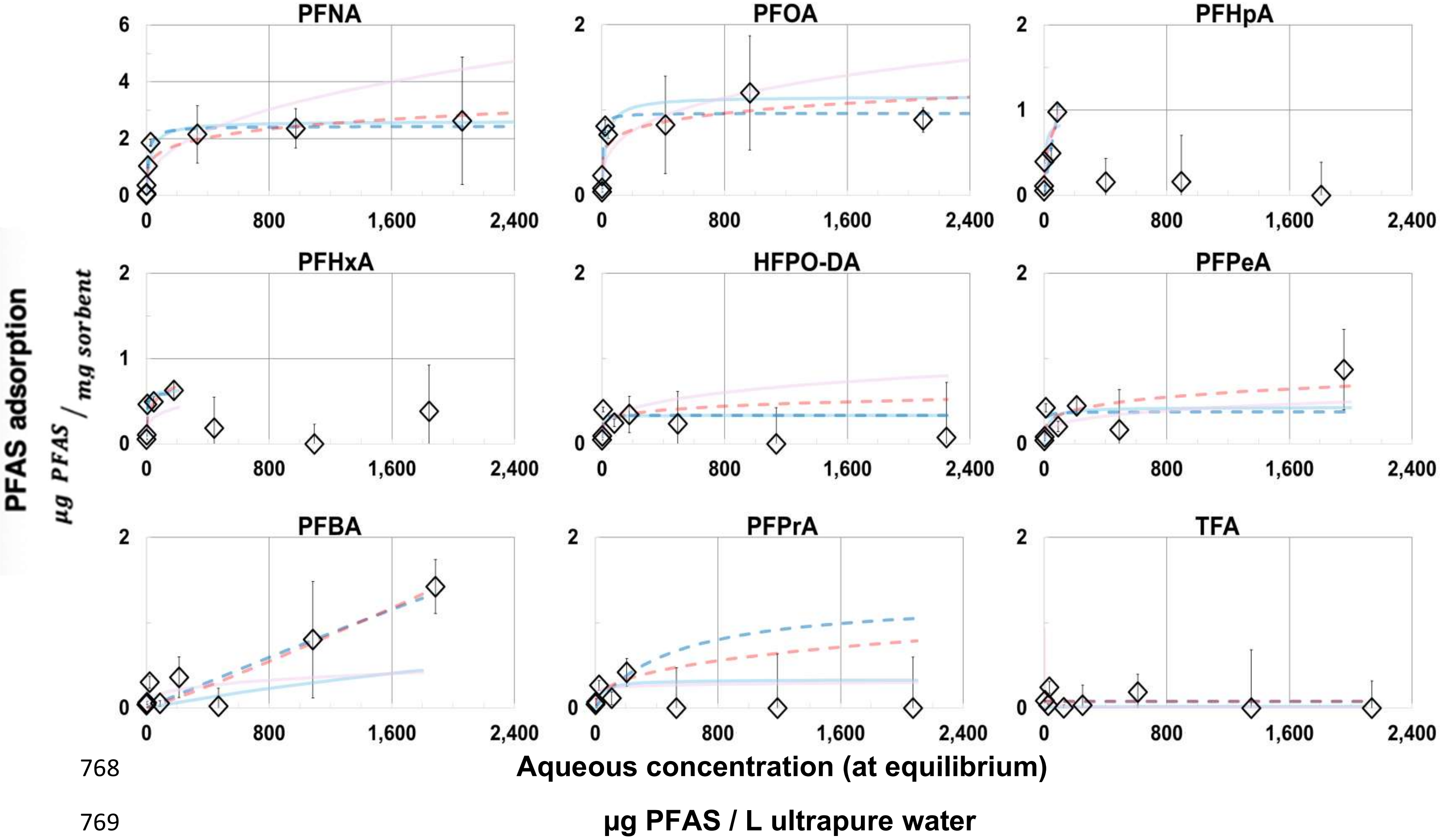


Table S.17 Surface-modified Clay – Adsorption Capacity and Isotherm Model Parameters Summary

SURFACE-MODIFIED CLAY											
18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		**PFAS**	q_{max}			**Langmuir**	**[L / ug PFAS]**	**[µg PFAS / mg sorbent]**	**Freundlich**	**(µg PFAS / mg sorbent) * (L / µg)^(1/n)**	**-**
			[µg PFAS / mg sorbent]	**[µmol PFAS / mg sorbent]**		r^2	K_L	q_{max}	r^2	K_F	$\frac{1}{n}$
[redacted]		Σ PFCAs	5.78	0.015	*linear*	0.91	4.1E-03	6.3	0.88	0.15	0.51
					non-linear	0.87	6.4E-03	5.6	0.89	0.28	0.41
		Σ PFSAs	21.95	0.038	*linear*	0.88	8.3E-04	20.2	0.94	0.43	0.41
					non-linear	0.83	8.8E-05	37.7	0.91	0.84	0.32
MW (g/mol)	# CF(2/3)	Σ All PFAS	18.86	0.046	*linear*	0.97	9.3E-04	17.9	0.85	0.53	0.37
					non-linear	0.89	2.7E-03	16.1	0.81	2.06	0.21
464	8	PFNA	2.6	#DIV/0!	*linear*	1.00	0.037	2.6	0.81	0.201	0.41
					non-linear	0.98	0.087	2.4	0.89	0.617	0.20
414	7	PFOA	1.2	#DIV/0!	*linear*	0.97	0.039	1.2	0.81	0.155	0.30
					non-linear	0.90	0.223	1.0	0.79	0.325	0.16
364	6	PFHpA	1.0	#DIV/0!	*linear*	0.83	0.128	0.9	0.87	0.146	0.41
					non-linear	0.85	0.003	4.4	0.84	0.179	0.35
314	5	PFHxA	0.6	#DIV/0!	*linear*	1.00	0.171	0.6	0.45	0.127	0.23
					non-linear	0.92	0.345	0.6	0.81	0.196	0.23
330	5	HFPO-DA	0.4	#DIV/0!	*linear*	0.97	0.168	0.3	0.74	0.098	0.27
					non-linear	0.69	0.570	0.3	0.49	0.153	0.16
264	4	PFPeA	0.9	#DIV/0!	*linear*	0.81	0.042	0.4	0.42	0.071	0.26
					non-linear	0.60	0.229	0.4	0.46	0.115	0.23
214	3	PFBA	1.4	#DIV/0!	*linear*	0.00	0.000	1.8	0.32	0.042	0.31
					non-linear	0.87	0.000	20.1	0.89	0.000	1.10
164	2	PFPrA	0.4	#DIV/0!	*linear*	0.46	0.025	0.3	0.02	0.166	0.08
					non-linear	0.56	0.002	1.3	0.57	0.049	0.36
114	1	TFA	0.2	#DIV/0!	*linear*	0.21	0.022	0.0	0.26	0.935	-0.77
					non-linear	0.01	361.981	0.1	#DIV/0!	0.080	0.00
500	8	PFOS	11.9	0.0238	*linear*	0.85	0.005	13.0	0.80	0.160	0.63
					non-linear	0.98	0.002	16.8	0.99	0.329	0.49
450	7	PFHpS	6.0	0.0133	*linear*	0.89	0.007	6.1	0.93	0.676	0.28
					non-linear	0.89	0.003	6.9	0.94	0.425	0.36
400	6	PFHxS	2.4	0.0059	*linear*	1.00	0.049	2.3	0.78	0.729	0.17
					non-linear	0.93	0.155	2.2	0.78	0.727	0.16
428	6	6:2-FTS	1.2	0.0028	*linear*	0.29	0.004	0.6	0.00	0.559	-0.03
					non-linear	0.20	0.006	1.3	0.29	0.244	0.15
350	5	PFPeS	1.6	0.0046	*linear*	0.95	0.170	1.7	0.83	0.234	0.29
					non-linear	0.89	0.263	1.3	0.71	0.500	0.14
300	4	PFBS	1.7	0.0057	*linear*	0.46	0.004	1.2	0.66	0.167	0.23
					non-linear	0.40	0.501	0.9	0.52	0.224	0.22
250	3	PFPrS	0.7	0.0028	*linear*	0.87	0.040	0.7	0.21	0.143	0.14
					non-linear	0.35	1.119	0.4	0.15	0.240	0.09
200	2	PFEtS	0.7	0.0037	*linear*	0.46	0.034	0.6	0.06	0.150	-0.11
					non-linear	0.17	0.739	0.3	0.00	0.216	0.01
150	1	TFMS	0.3	0.0021	*linear*	0.54	0.047	0.3	0.33	0.079	0.21
					non-linear	0.21	0.118	0.4	0.52	0.072	0.25

Figure S.14D. Comparison of ultrapure adsorption isotherms for the two alternative adsorbents evaluated GACS.

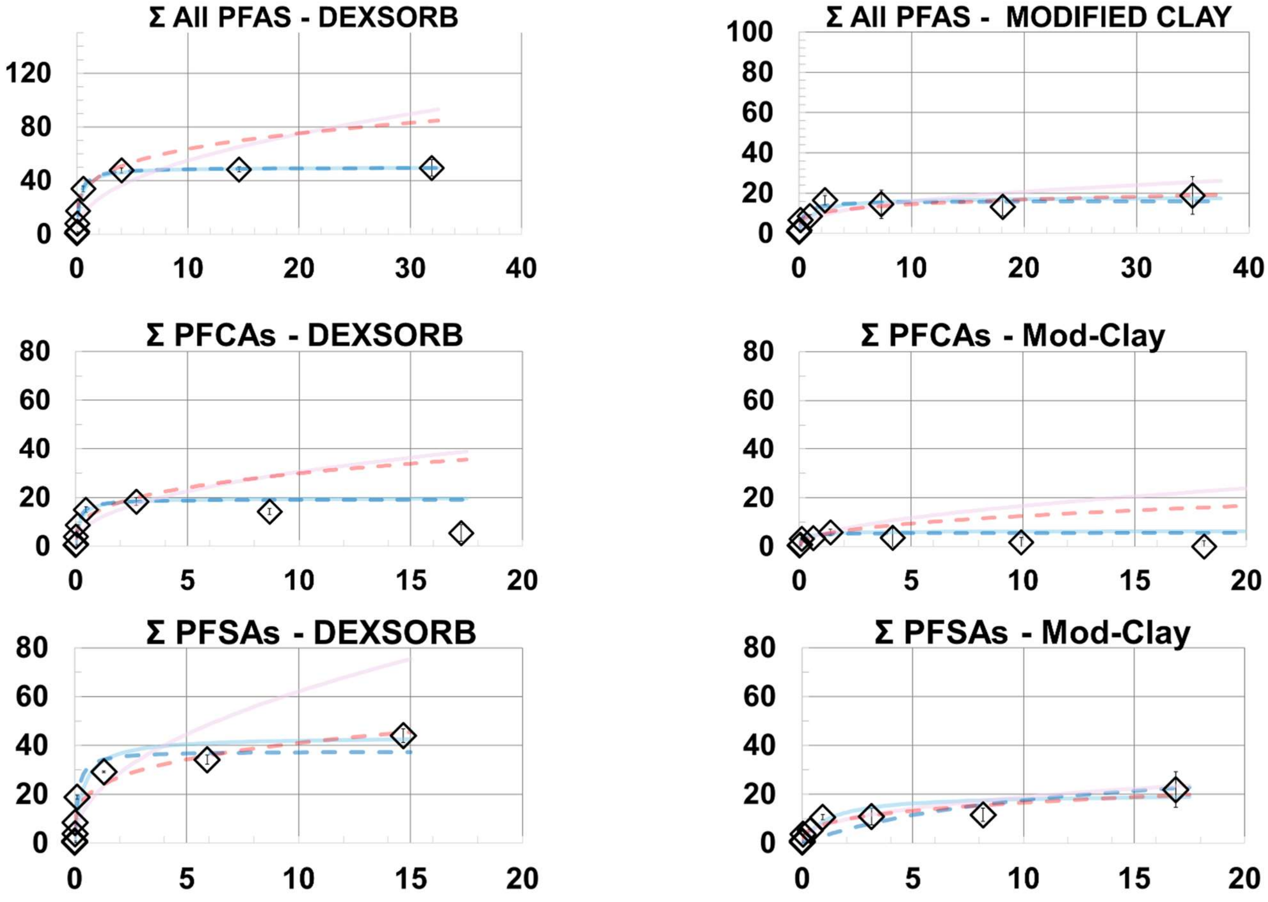


Figure S.15A IRA910 IX – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

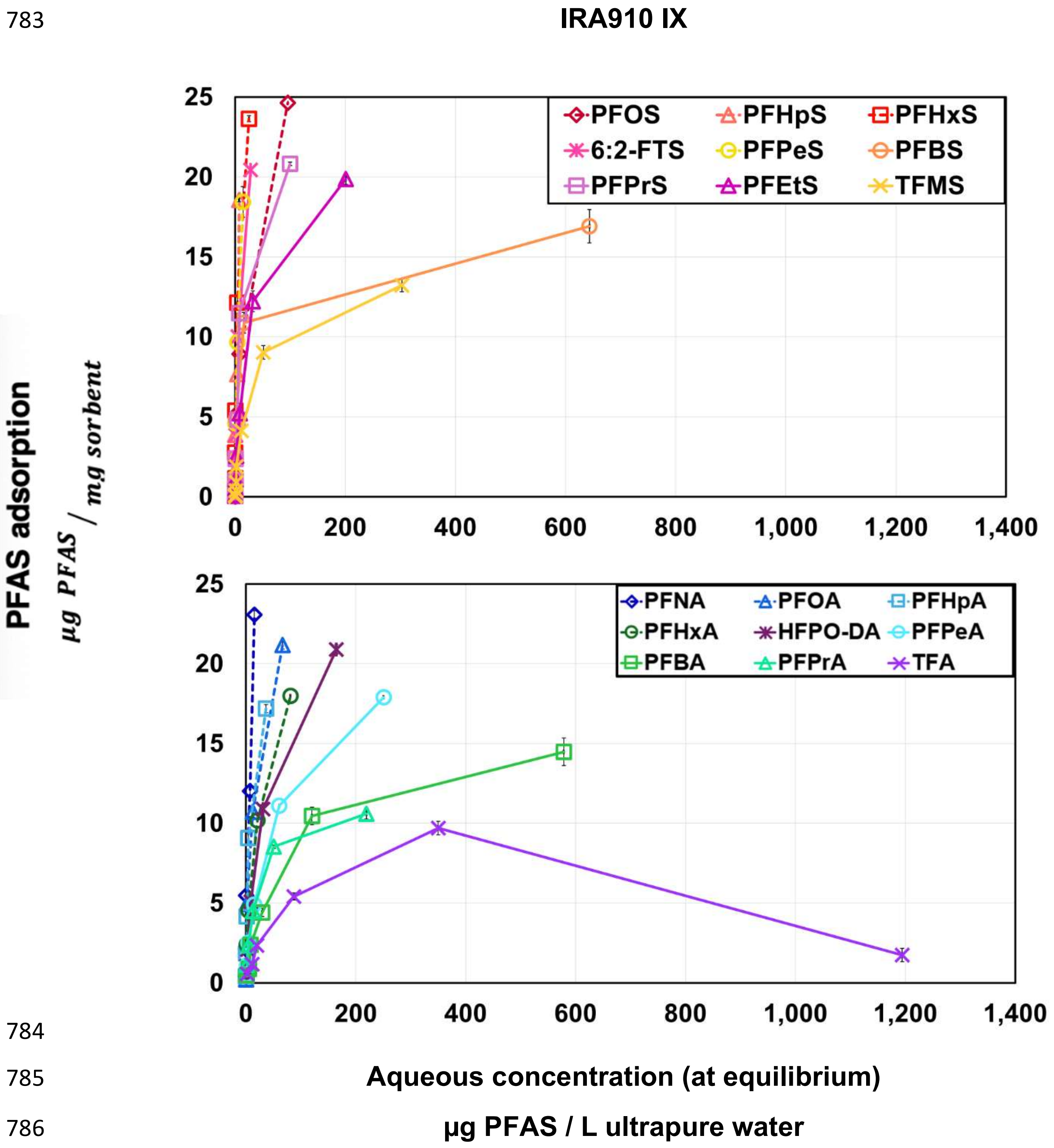


Figure S.15B IRA910 IX – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

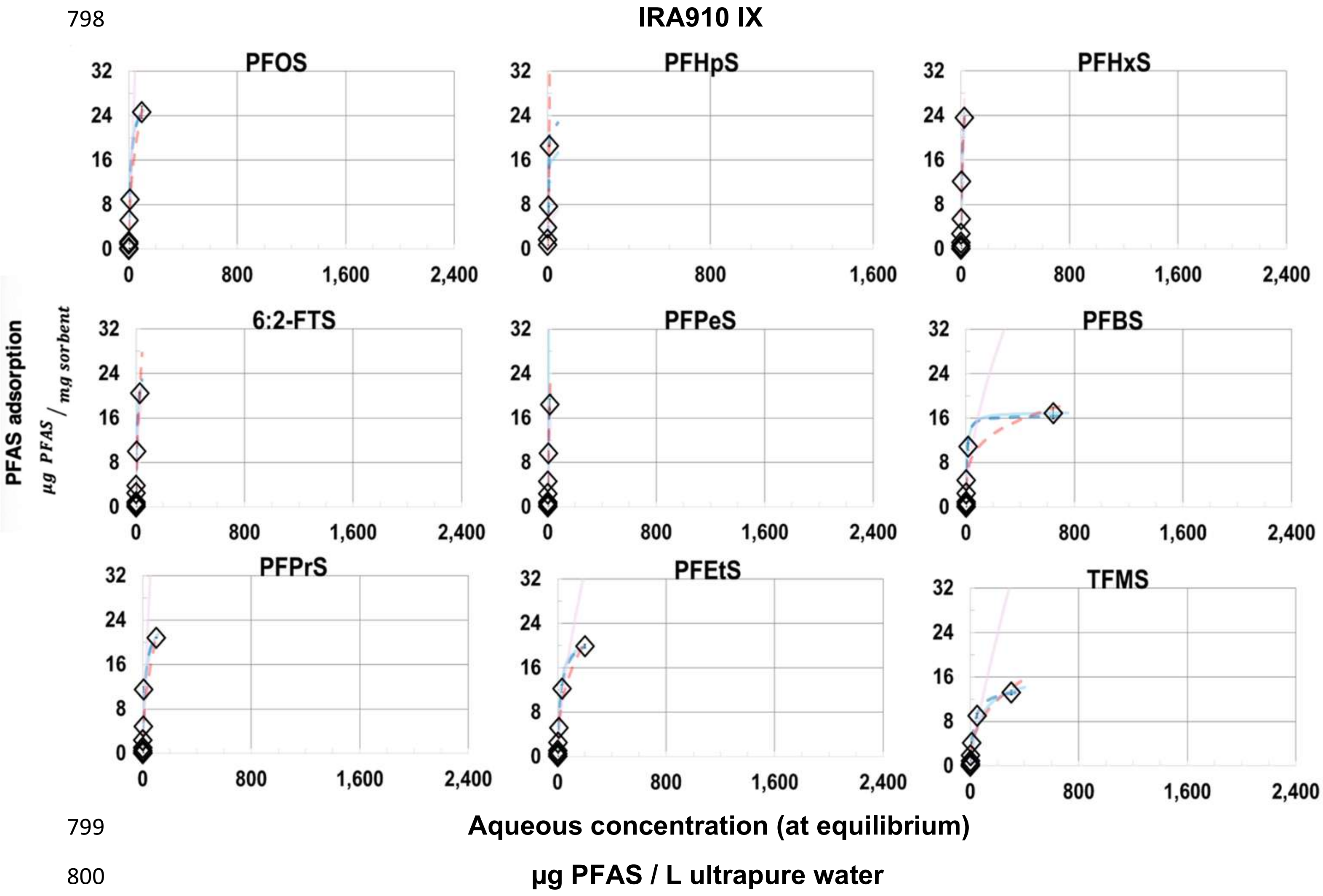


Figure S.15C IRA910 IX – Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

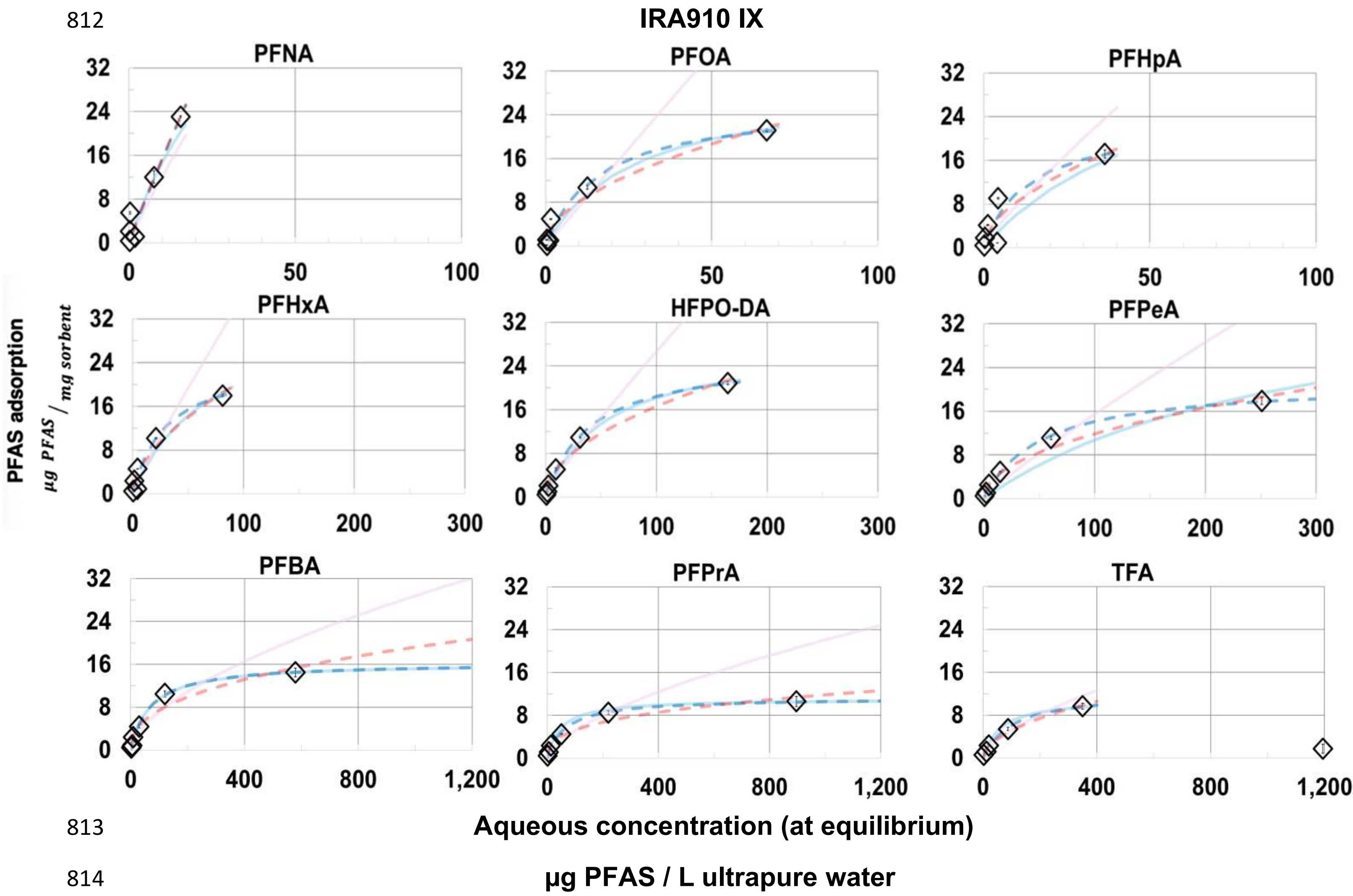


Table S.18 IRA910 IX – Adsorption Capacity and Isotherm Model Parameters Summary

IRA910 IX											
18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		PFAS	q_{max}			Langmuir	[L / ug PFAS]	[µg PFAS / mg sorbent]	Freundlich	(µg PFAS / mg sorbent) * (L / µg)^(1/n)	-
			[µg PFAS / mg sorbent]	[µmol PFAS / mg sorbent]		r^2	K_L	q_{max}	r^2	K_F	$1/n$
		Σ PFCAs	145.1	0.3762	*linear*	0.98	1.7E-03	170.4	0.94	0.48	0.78
					non-linear	0.90	1.6E-03	170.4	0.96	3.49	0.47
		Σ PFSAs	176.6	0.5772	*linear*	1.00	8.7E-03	190.6	0.89	3.92	0.58
					non-linear	0.99	7.9E-03	190.8	0.96	9.37	0.41
MW (g/mol)	# $\mathrm{CF}_{(2/3)}$	Σ All PFAS	321.7	0.9533	*linear*	0.93	9.7E-04	392.4	0.91	0.65	0.82
					non-linear	0.92	1.1E-03	378.3	0.90	1.50	1.00
464	8	PFNA	23.1	0.0497	*linear*	0.03	0.029	65.5	0.52	1.497	0.91
					non-linear	0.01	0.006	277.4	0.01	1.834	0.92
414	7	PFOA	21.2	0.0456	*linear*	0.69	0.037	30.1	0.83	0.730	0.99
					non-linear	0.61	0.063	26.0	0.58	2.436	0.52
364	6	PFHpA	17.2	0.0472	*linear*	0.04	0.018	40.7	0.70	1.114	0.85
					non-linear	0.04	0.076	23.3	0.09	2.401	0.55
314	5	PFHxA	18.0	0.0388	*linear*	0.22	0.014	35.2	0.87	0.566	0.90
					non-linear	0.55	0.033	24.6	0.58	1.534	0.57
330	5	HFPO-DA	20.9	0.0450	*linear*	0.86	0.018	28.3	0.95	0.471	0.88
					non-linear	0.96	0.024	26.0	0.97	1.573	0.51
264	4	PFPeA	17.9	0.0386	*linear*	0.05	0.003	41.3	0.78	0.256	0.89
					non-linear	0.92	0.019	21.4	0.95	1.252	0.49
214	3	PFBA	14.5	0.0312	*linear*	0.96	0.014	16.3	0.94	0.445	0.60
					non-linear	0.89	0.014	16.3	0.93	1.122	0.41
164	2	PFPrA	10.6	0.0647	*linear*	1.00	0.021	11.1	0.94	0.279	0.63
					non-linear	0.84	0.015	11.3	0.95	1.031	0.35
114	1	TFA	9.7	0.0851	*linear*	0.94	0.017	11.1	0.97	0.271	0.64
					non-linear	0.01	0.010	12.5	0.04	0.477	0.52
500	8	PFOS	24.6	0.0493	*linear*	0.98	0.080	27.8	0.70	0.767	0.97
					non-linear	0.99	0.066	28.4	0.99	2.963	0.47
450	7	PFHpS	18.6	0.0412	*linear*	0.88	4.803	0.5	0.11	2.555	0.26
					non-linear	0.88	0.002	15.0	0.94	0.759	1.59
400	6	PFHxS	23.6	0.0591	*linear*	0.09	0.046	45.7	0.56	2.947	0.69
					non-linear	0.97	0.213	27.8	0.96	5.342	0.47
428	6	6:2-FTS	20.4	0.0478	*linear*	0.59	0.130	25.7	0.91	6.260	0.29
					non-linear	0.95	0.100	27.9	0.92	2.843	0.60
350	5	PFPeS	18.4	0.0527	*linear*	0.01	-0.332	-4.9	0.36	1.685	0.73
					non-linear	0.97	0.167	25.9	0.97	4.030	0.58
300	4	PFBS	16.9	0.0564	*linear*	1.00	0.119	17.1	0.80	1.149	0.59
					non-linear	0.98	0.173	16.5	0.90	3.356	0.26
250	3	PFPrS	20.8	0.0833	*linear*	0.91	0.047	25.5	0.89	1.022	0.86
					non-linear	1.00	0.065	24.0	0.99	1.913	0.52
200	2	PFEtS	19.9	0.0993	*linear*	0.98	0.054	21.6	0.91	0.999	0.66
					non-linear	1.00	0.038	22.4	0.97	2.361	0.41
150	1	TFMS	13.2	0.0881	*linear*	0.68	0.013	16.9	0.82	0.268	0.85
					non-linear	0.94	0.035	14.4	0.95	1.384	0.41

Figure S.16A PFA694 IX – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

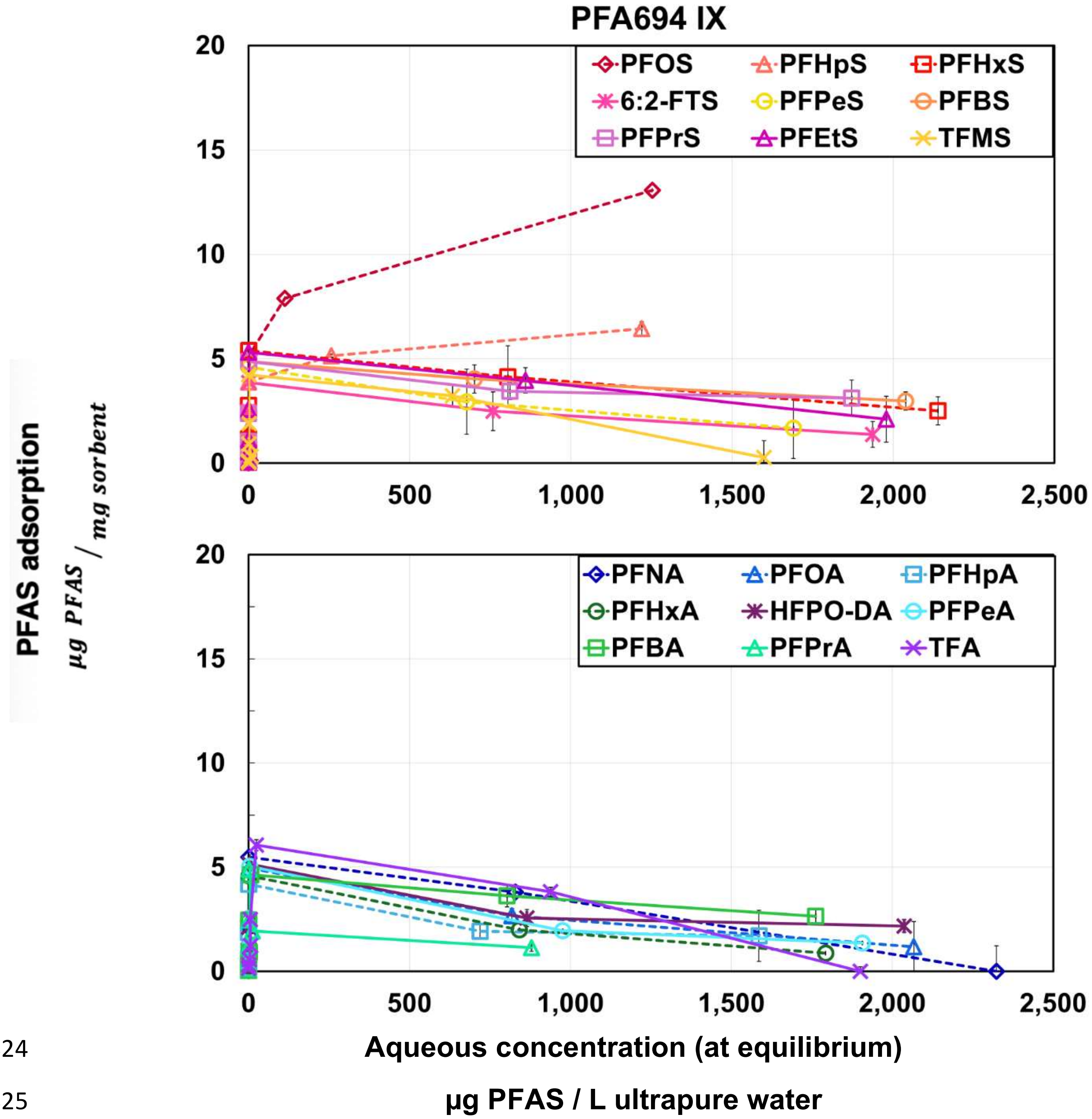


Figure S.16B PFA694 IX – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity q_e $[(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

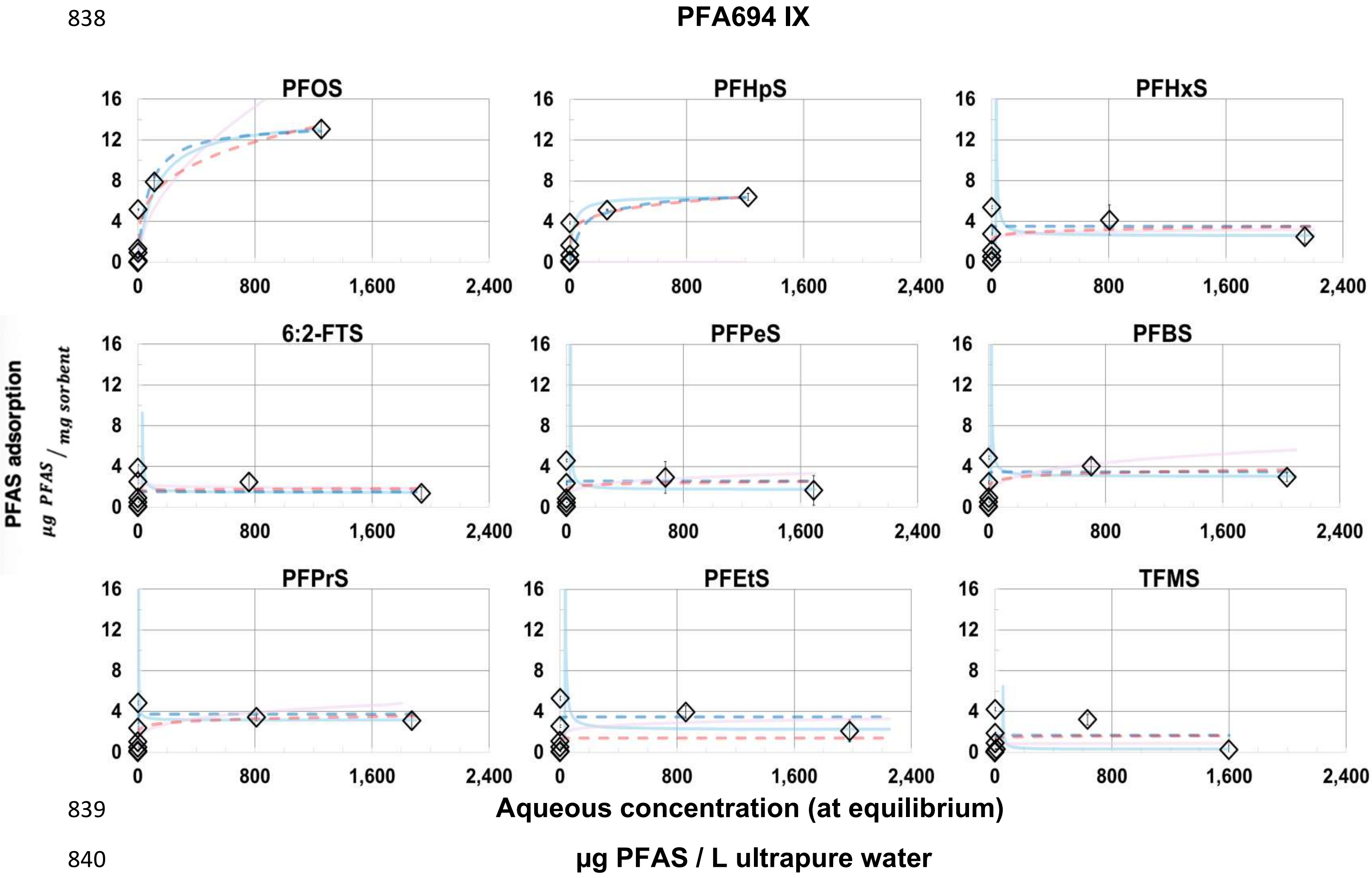


Figure S.16C PFA694 IX – Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity q_e $[(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

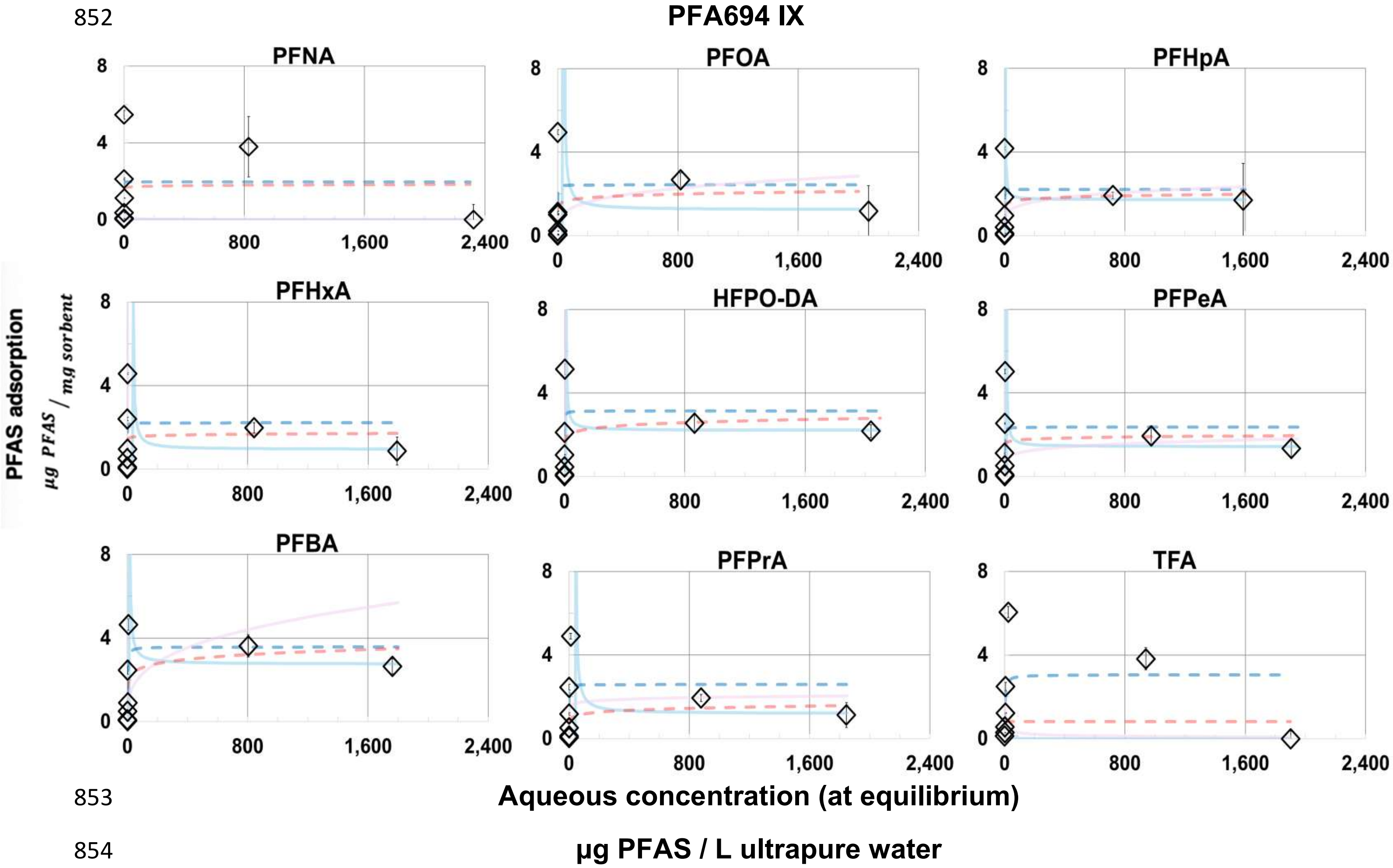


Table S.19 PFA694 IX – Adsorption Capacity and Isotherm Model Parameters Summary

PFA694 IX											
18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		PFAS	q_{max}			Langmuir	[L / ug PFAS]	[µg PFAS / mg sorbent]	Freundlich	(µg PFAS / mg sorbent) * (L / µg)^(1/n)	-
			[µg PFAS / mg sorbent]	[µmol PFAS / mg sorbent]		r^2	K_L	q_{max}	r^2	K_F	$\frac{1}{n}$
		Σ PFCAs	44.96	0.159	*linear*	0.89	-2.1E-03	6.3	0.23	2.79	0.21
					non-linear	0.36	1.2E-01	23.4	0.03	2.74	0.15
		Σ PFSAs	42.17	0.145	*linear*	1.00	1.4E-01	33.9	0.32	3.12	0.28
					non-linear	0.37	7.7E-03	37.7	0.35	3.79	0.26
MW (g/mol)	# CF(2/3)	Σ All PFAS	87.13	0.304	*linear*	0.98	-2.8E-03	40.8	0.38	3.98	0.29
					non-linear	0.53	5.1E-02	59.2	0.22	19.71	0.10
464	8	PFNA	5.5	0.0118	*linear*	0.88	-0.012	0.0	0.18	0.314	-0.38
					non-linear	0.04	12.578	2.0	0.00	1.594	0.02
414	7	PFOA	5.0	0.0107	*linear*	0.95	-0.026	1.2	0.31	0.429	0.25
					non-linear	0.31	1.886	2.4	0.07	1.269	0.07
364	6	PFHpA	4.2	0.0115	*linear*	1.00	-0.196	1.7	0.21	0.639	0.18
					non-linear	0.27	5.497	2.2	0.07	1.331	0.05
314	5	PFHxA	4.6	0.0099	*linear*	0.94	-0.028	1.0	0.53	2.945	1.47
					non-linear	0.21	4.071	2.2	0.01	1.395	0.03
330	5	HFPO-DA	5.1	0.0111	*linear*	1.00	-0.111	2.2	0.82	1.558	1.04
					non-linear	0.53	1.693	3.1	0.17	1.523	0.08
264	4	PFPeA	5.0	0.0108	*linear*	0.98	-0.082	1.4	0.11	0.564	0.15
					non-linear	0.14	1.190	2.4	0.02	1.476	0.04
214	3	PFBA	4.6	0.0100	*linear*	0.99	-0.082	2.8	0.53	0.537	0.31
					non-linear	0.69	0.643	3.6	0.40	1.615	0.10
164	2	PFPrA	4.9	0.0299	*linear*	0.96	-0.024	1.2	0.06	1.384	0.05
					non-linear	0.41	2.033	2.6	0.06	0.745	0.10
114	1	TFA	6.1	0.1000	*linear*	0.78	-0.013	0.0	0.18	2.007	-0.42
					non-linear	0.30	0.323	3.1	0.00	0.814	0.00
550	8	PFOS	13.1	0.0261	*linear*	0.88	0.008	14.3	0.52	0.413	0.54
					non-linear	0.88	0.014	13.6	0.88	1.780	0.28
500	7	PFHpS	6.4	0.0143	*linear*	1.00	0.041	6.5	#VALUE!	#VALUE!	#VALUE!
					non-linear	0.74	0.012	6.8	#N/A	1.819	0.18
450	6	PFHxS	5.4	0.0135	*linear*	0.98	-0.037	2.6	0.11	1.942	0.07
					non-linear	0.33	4.684	3.5	0.18	1.916	0.08
428	6	6:2-FTS	3.9	0.0090	*linear*	0.97	-0.039	1.4	0.41	2.684	-0.05
					non-linear	0.00	482.847	1.5	0.02	1.451	0.03
400	5	PFPeS	4.6	0.0132	*linear*	0.97	-0.041	1.8	0.31	0.784	0.19
					non-linear	0.36	10.487	2.6	0.13	1.598	0.06
350	4	PFBS	4.9	0.0162	*linear*	0.99	-0.062	3.0	0.39	0.773	0.26
					non-linear	0.44	4.117	3.5	0.28	1.776	0.10
300	3	PFPrS	4.9	0.0194	*linear*	1.00	-0.222	3.2	0.35	0.794	0.24
					non-linear	0.64	3.253	3.7	0.30	1.783	0.09
250	2	PFEtS	5.3	0.0265	*linear*	0.96	-0.031	2.2	0.19	1.286	0.12
					non-linear	0.45	11.036	3.5	#NUM!	1.411	0.00
200	1	TFMS	4.2	0.0282	*linear*	0.88	-0.019	0.3	0.00	0.769	0.02
					non-linear	0.78	4.629	1.7	0.01	1.299	0.03

Figure S.17A PSR2+ IX – Multi-component Adsorption Isotherms

Equilibrium adsorption capacity $q_e[\frac{\mu g\ PFAS}{mg\ sorbent}]$ vs equilibrium PFAS aqueous concentration $[\frac{\mu g\ PFAS}{L}]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

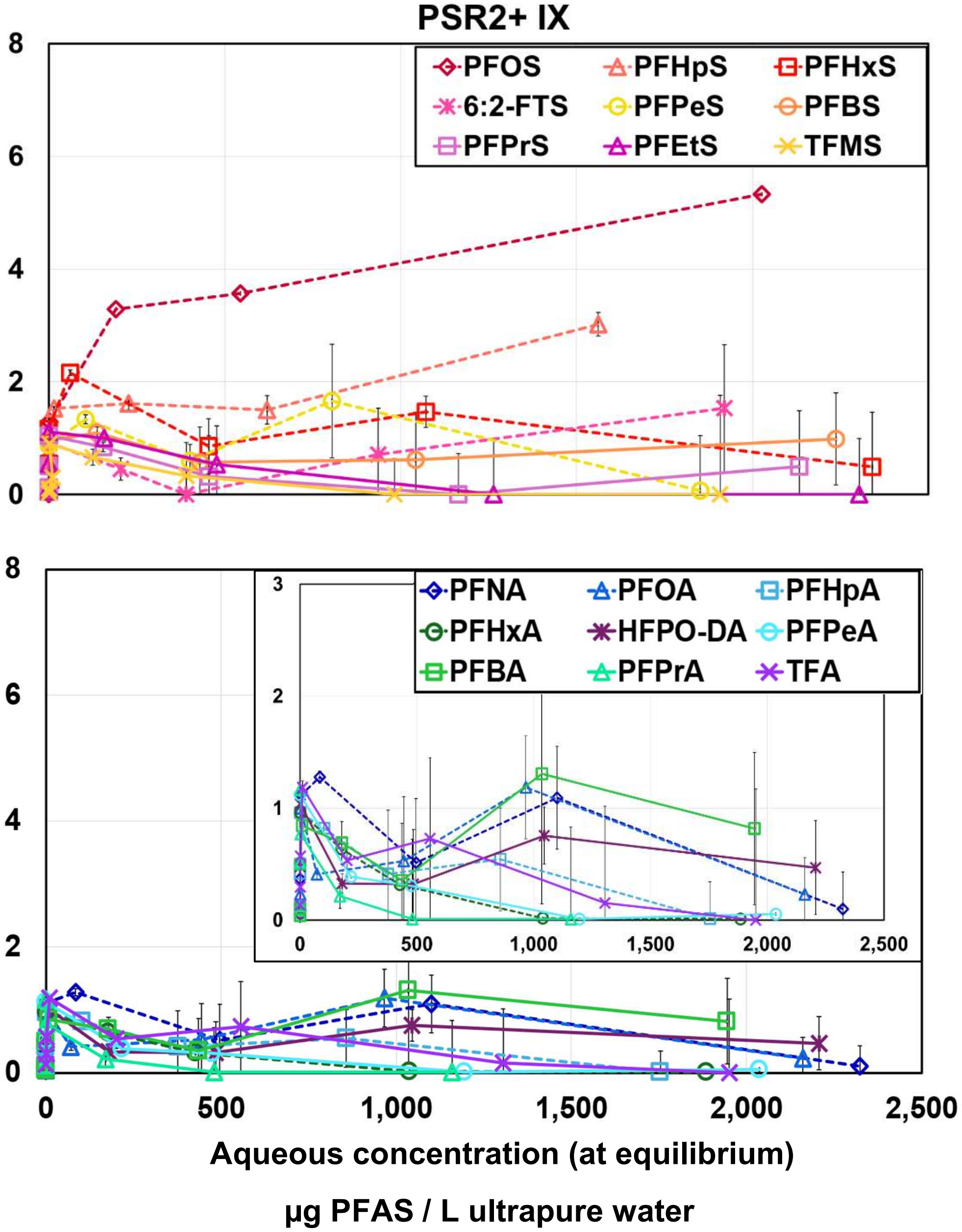


Figure S.17B PSR2+ IX – Adsorption Isotherms for PFSAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

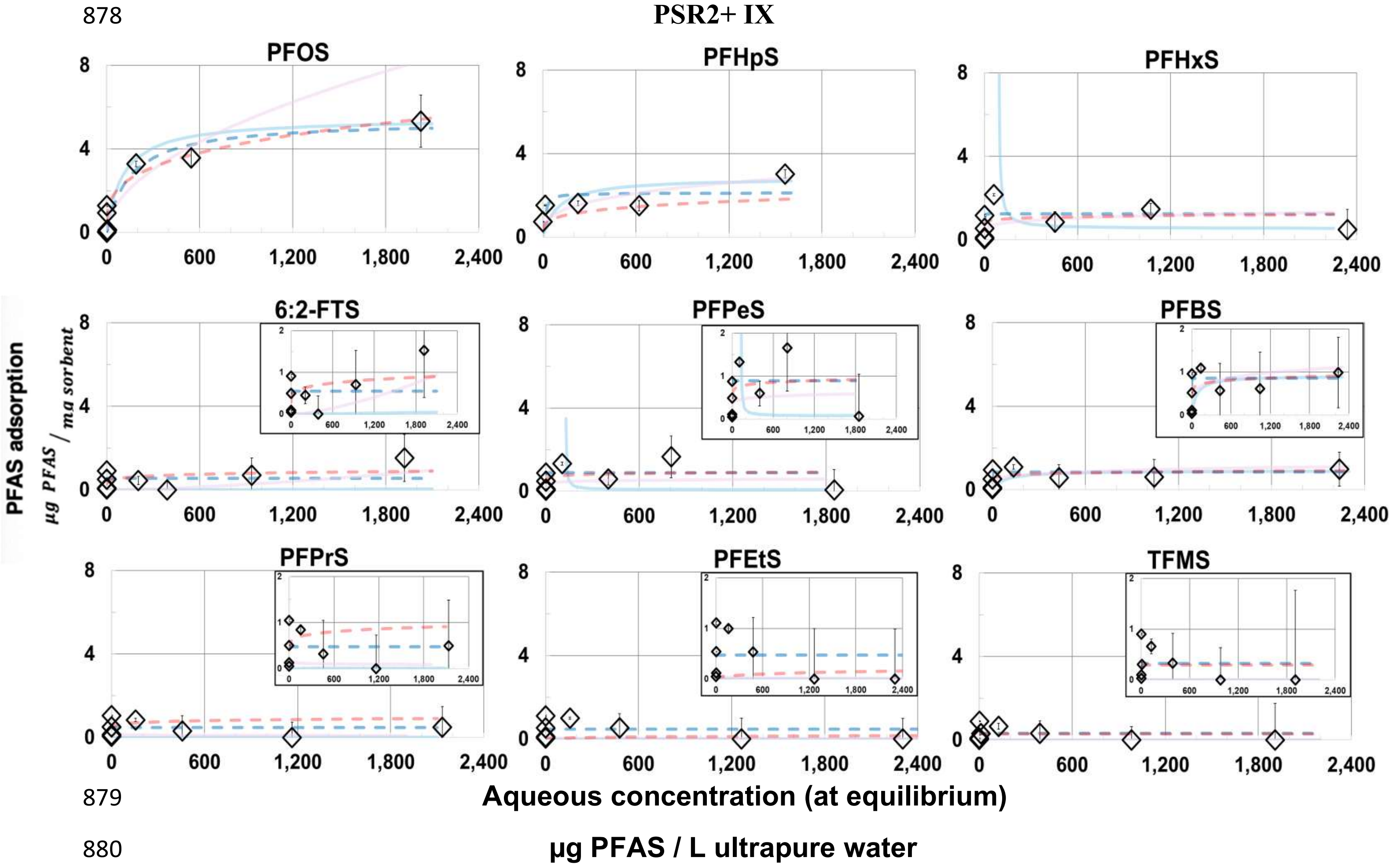


Figure S.17C PSR2+ IX – Adsorption Isotherms for PFCAs

Equilibrium adsorption capacity $q\_e\ [(\mu g\ PFAS)/(mg\ sorbent)]$ vs equilibrium PFAS aqueous concentration $[(\mu g\ PFAS)/L]$ for individual PFAS analytes evaluated in a mixed system. Values shown are averages of triplicate experiments, and error bars show the standard deviation. Blue lines are models fit to the Langmuir Equation; and Red lines are the models fit to the Freundlich Equation. Solid lines depict fits using the linearized form of either model; and dashed lines depict non-linearized fits, minimizing the square error between data points and modeled results with the Solver function in MS Excel.

Experimental Conditions: Ultrapure water, 18-PFAS mixed system **(Table S.1)**, 100 mg/L (5mg) as-received sorbent dose in 50 mL Polypropylene test tube. Equilibration time: 4 days (96 hours), while rotating at 40 rpm, room temperature.

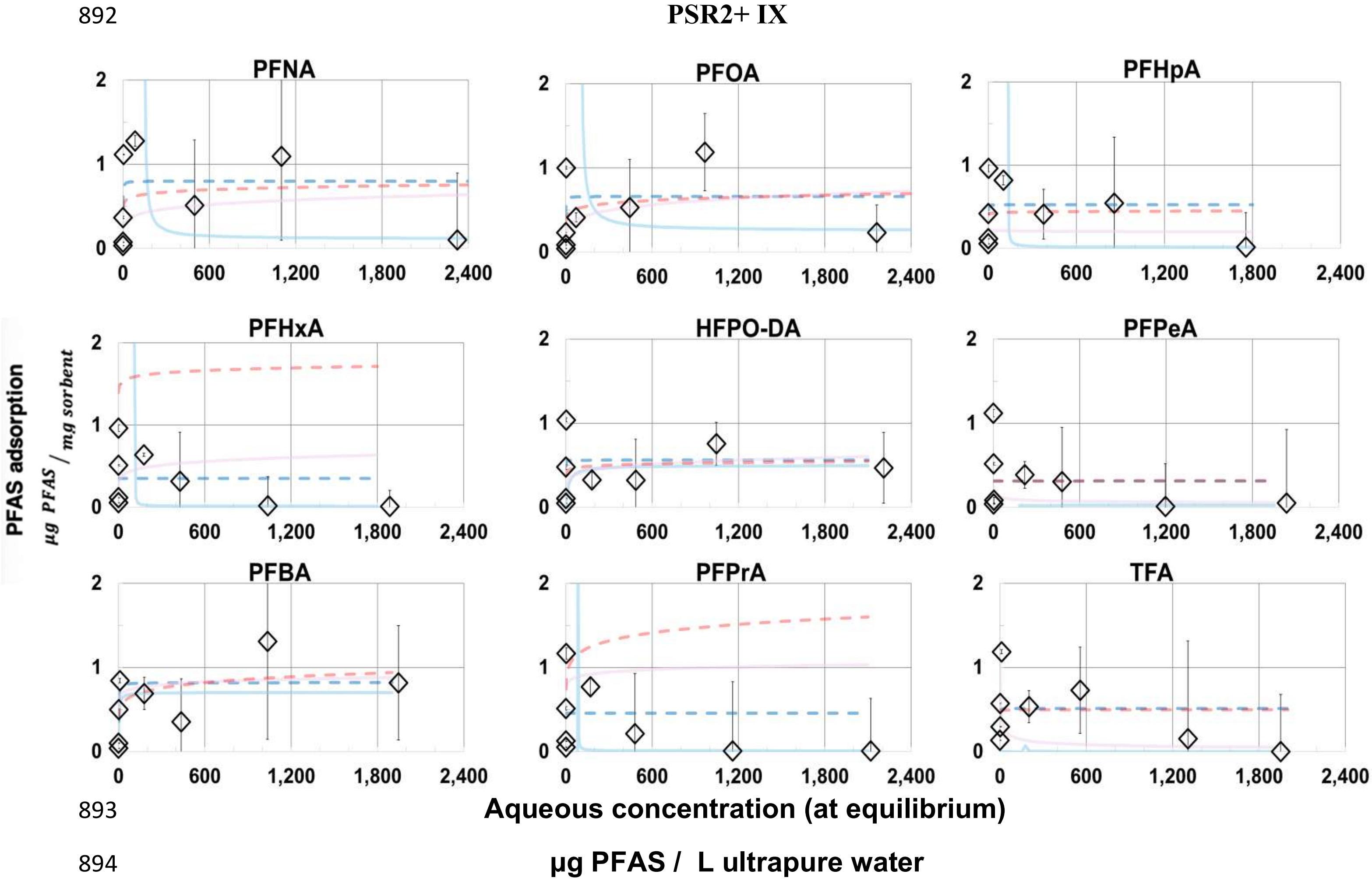


Table S.20 PSR2+ IX – Adsorption Capacity and Isotherm Model Parameters Summary

PSR2+ IX											
18-PFAS Mixed System Ultrapure Water Adsorption Isotherms		PFAS	q_{max}			**Langmuir**	[L / ug PFAS]	[µg PFAS / mg sorbent]	**Freundlich**	(µg PFAS / mg sorbent) * (L / µg)^(1/n)	-
			[µg PFAS / mg sorbent]	[µmol PFAS / mg sorbent]		r^2	K_L	q_{max}	r^2	K_F	$\frac{1}{n}$
		Σ PFCAs	9.39	0.033	*linear*	0.91	-1.3E-03	1.9	0.12	1.69	0.09
					non-linear	0.23	2.8E-01	4.7	0.00	2.74	0.15
		Σ PFSAs	10.35	0.033	*linear*	1.00	-1.0E-02	8.1	0.51	1.26	0.23
					non-linear	0.60	1.5E-01	8.7	0.48	3.35	0.11
MW (g/mol)	# $CF_{(2/3)}$	Σ All PFAS	18.03	0.063	*linear*	0.83	-4.4E-04	2.3	0.14	2.90	0.12
					non-linear	0.35	9.9E-02	11.8	0.06	6.89	0.04
464	8	PFNA	1.3	0.0028	*linear*	0.82	-0.007	0.1	0.19	0.204	0.15
					non-linear	0.33	1.686	0.8	0.10	0.480	0.06
414	7	PFOA	1.2	0.0026	*~~linear~~*	0.87	-0.010	0.3	0.38	0.176	0.18
					~~non-linear~~	0.38	1.831	0.7	0.17	0.351	0.09
364	6	PFHpA	1.0	0.0026	*linear*	0.78	-0.008	0.0	0.00	0.236	-0.02
					non-linear	0.14	7.562	0.5	0.01	0.403	0.01
314	5	PFHxA	1.0	0.0021	*linear*	0.92	-0.009	0.0	0.16	0.258	0.12
					non-linear	0.01	28.408	0.4	0.07	1.395	0.03
330	5	HFPO-DA	1.0	0.0022	*linear*	0.95	0.059	0.5	0.21	0.224	0.13
					non-linear	0.32	7.000	0.6	0.08	0.392	0.04
264	4	PFPeA	1.1	0.0024	*linear*	0.41	0.017	0.0	0.24	0.256	-0.20
					non-linear	0.75	56129.297	0.3	0.37	0.314	0.00
214	3	PFBA	1.3	0.0028	*linear*	1.00	0.382	0.7	0.32	0.581	0.06
					non-linear	0.53	0.787	0.8	0.49	0.388	0.12
164	2	PFPrA	1.2	0.0071	*linear*	0.96	-0.012	0.0	0.16	0.727	0.05
					non-linear	0.08	146.028	0.5	0.10	0.745	0.10
114	1	TFA	1.2	0.0104	*linear*	0.63	-0.006	0.0	0.26	1.042	-0.40
					non-linear	0.11	5.936	0.5	0.15	0.493	0.00
550	8	PFOS	5.3	0.0107	*linear*	0.98	0.010	5.5	0.65	0.152	0.52
					non-linear	0.93	0.007	5.3	0.94	0.605	0.29
500	7	PFHpS	3.0	0.0070	*linear*	0.88	0.010	2.8	0.60	0.280	0.31
					non-linear	0.88	0.125	2.1	0.60	0.334	0.23
450	6	PFHxS	2.2	0.0054	*linear*	0.91	-0.011	0.5	0.34	0.352	0.17
					non-linear	0.41	3.892	1.3	0.17	0.715	0.07
428	6	6:2-FTS	1.5	0.0036	*linear*	0.00	0.000	-0.2	0.19	0.000	1.51
					non-linear	0.00	39.519	0.6	0.19	0.288	0.15
400	5	PFPeS	1.7	0.0047	*linear*	0.83	-0.008	0.1	0.10	0.299	0.09
					non-linear	0.26	9.678	0.9	0.15	0.551	0.07
350	4	PFBS	1.1	0.0036	*linear*	0.94	0.014	0.9	0.50	0.275	0.18
					non-linear	0.72	4.525	0.9	0.37	0.480	0.08
300	3	PFPrS	1.0	0.0042	*linear*	0.13	0.003	0.0	0.05	0.210	-0.11
					non-linear	0.04	29.974	0.5	0.01	0.423	0.10
250	2	PFEtS	1.1	0.0055	*linear*	0.96	-0.012	0.0	0.33	0.208	-0.35
					non-linear	0.10	22115.621	0.5	0.13	0.010	0.36
200	1	TFMS	0.9	0.0060	*linear*	0.96	-0.014	0.0	0.11	0.194	-0.18
					non-linear	0.63	4.656	0.3	0.04	0.290	0.00

Figure S.17D. Comparison of ultrapure adsorption isotherms for the three evaluated IX resins

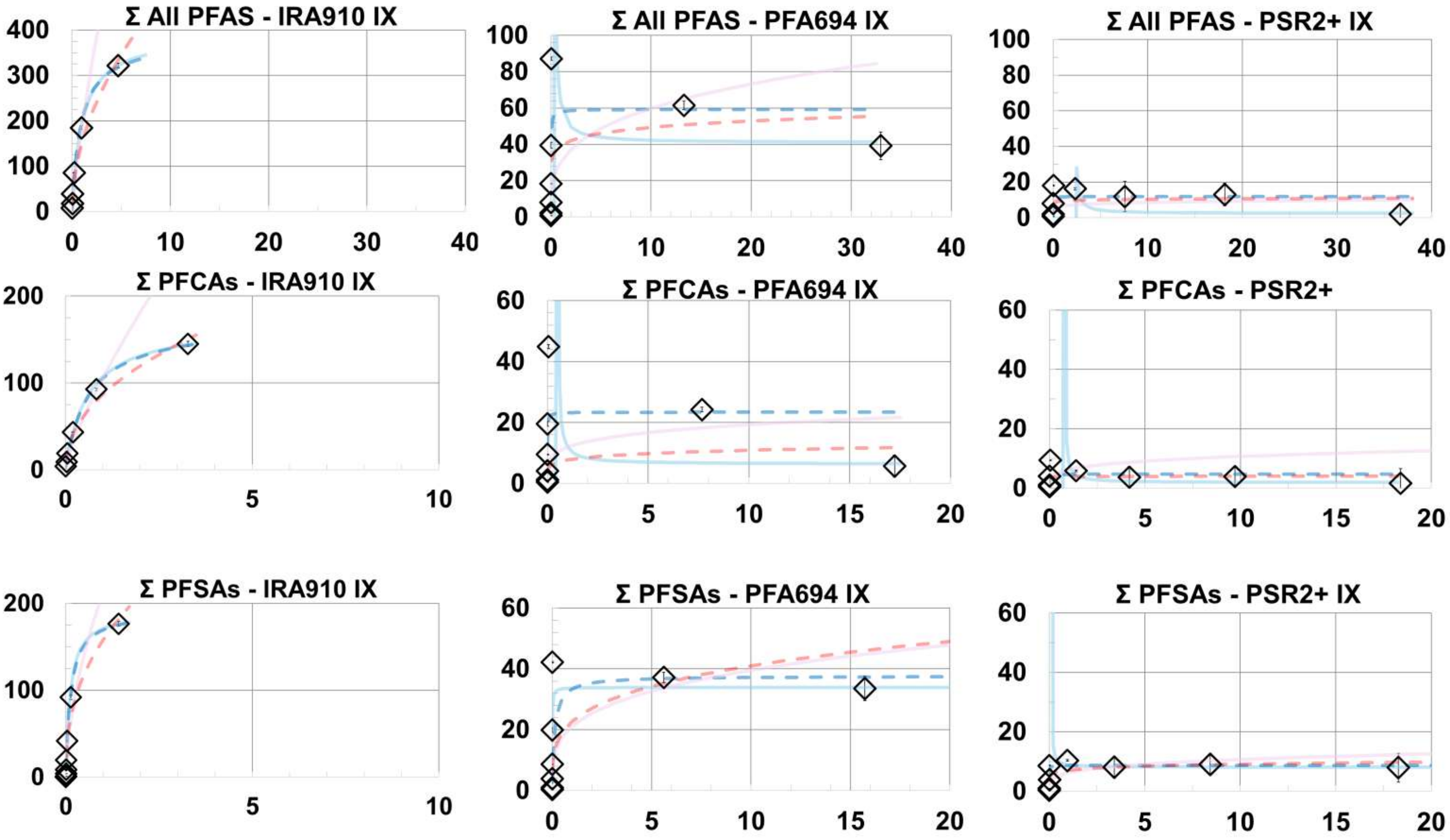
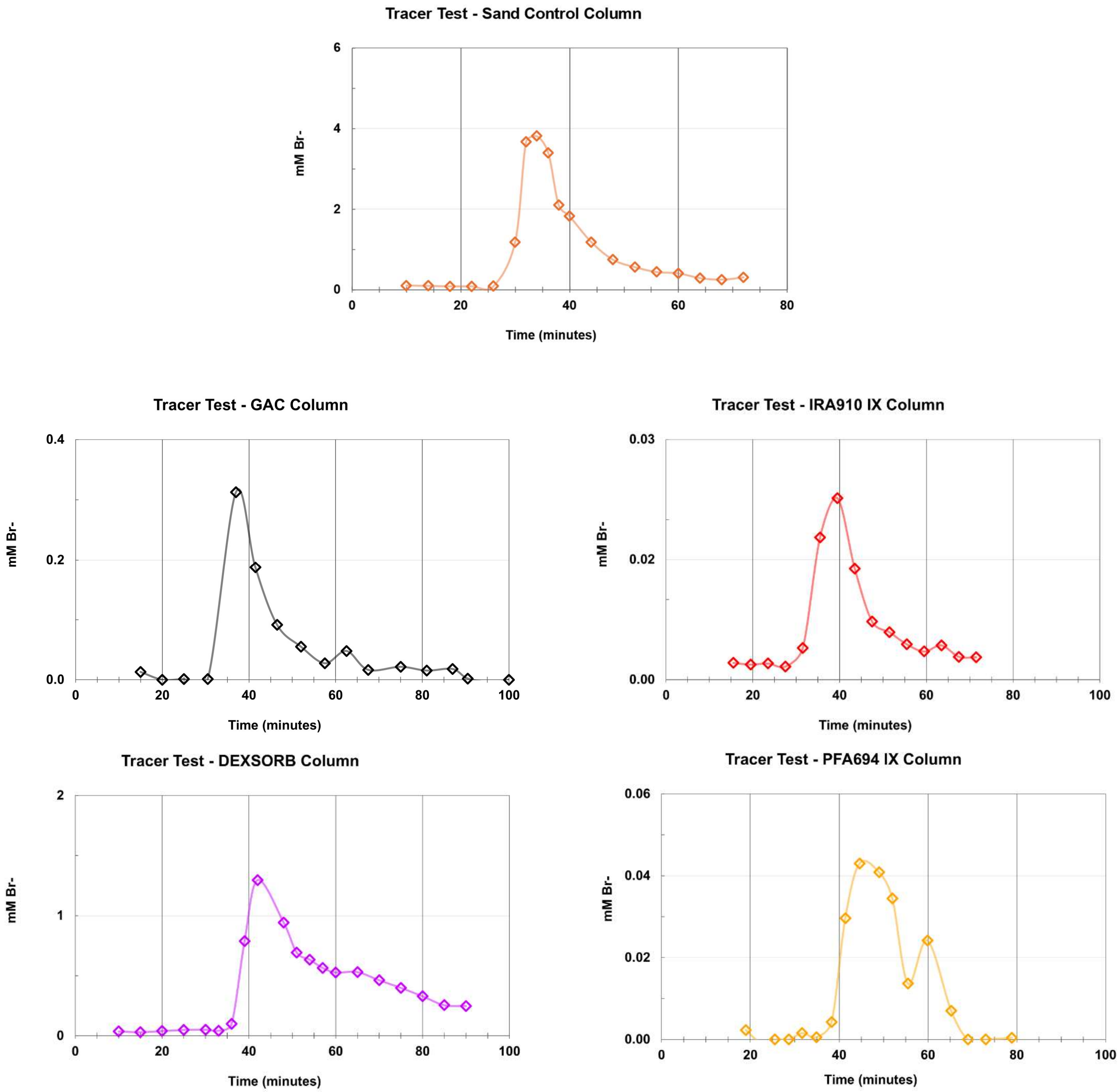
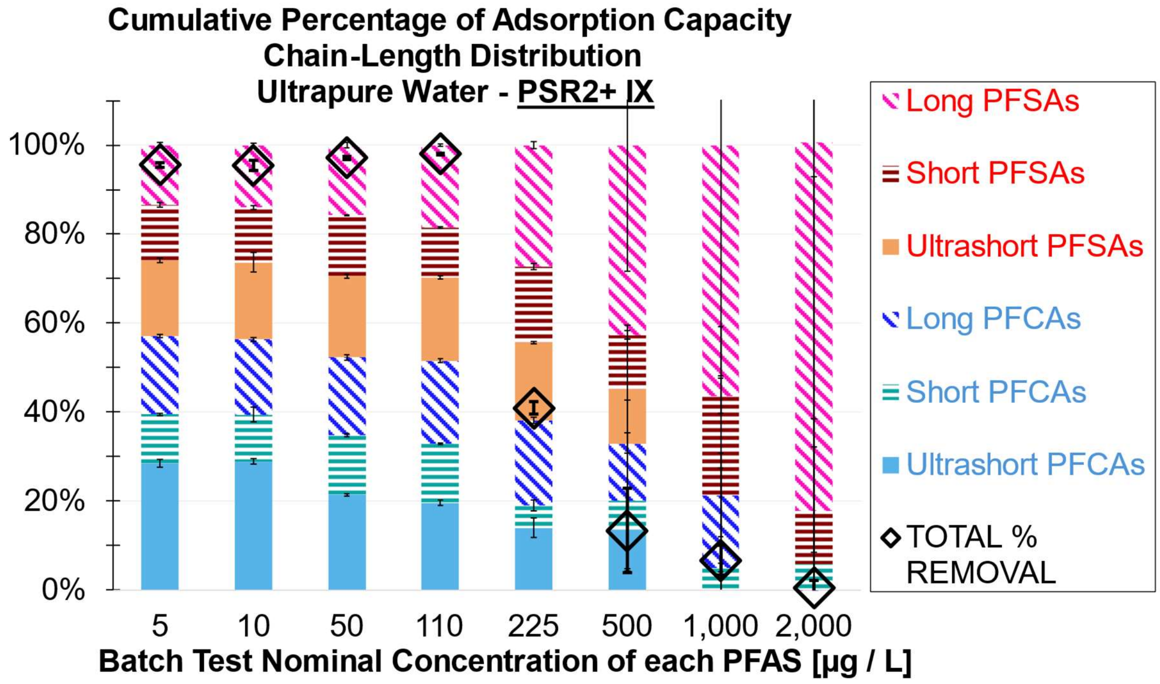
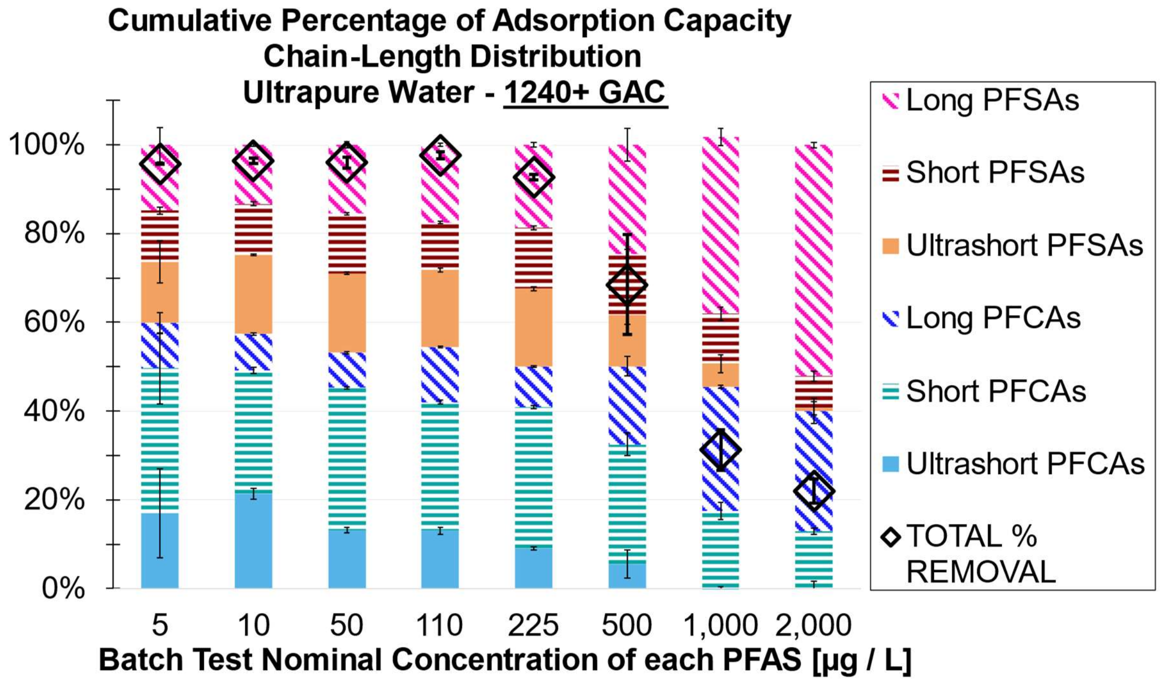


Figure S.18. Representative plots of the conservative bromide tracer test results for characterizing the test column pore volumes. The second replicate of each test media and sand control column was spiked with a ~3 second plug of either 50 mM, 200 mM, or 500 mM KBr solution in DI water. Columns were primed and equilibrated for at least 30 mins with DI water at the experimental flow rate prior to introducing the bromide plug. Bromide concentrations were measured in the test column effluent using a bromide ion selective electrode (ISE), after diluting and amending the sample with 5 M NaNO3 Ionic Strength Adjsuter (ISA)




Cumulative Percentage of Adsorption Capacity
Chain-Length Distribution
Ultrapure Water - PSR2+ IX
100%
80%
60%
40%
20%
0%
5
10
50
110
225
500
1,000
2,000
Batch Test Nominal Concentration of each PFAS [µg / L]
Long PFSAs
Short PFSAs
Ultrashort PFSAs
Long PFCAs
Short PFCAs
Ultrashort PFCAs
TOTAL % REMOVAL


Cumulative Percentage of Adsorption Capacity
Chain-Length Distribution
Ultrapure Water - 1240+ GAC
100%
80%
60%
40%
20%
0%
5
10
50
110
225
500
1,000
2,000
Batch Test Nominal Concentration of each PFAS [µg / L]
Long PFSAs
Short PFSAs
Ultrashort PFSAs
Long PFCAs
Short PFCAs
Ultrashort PFCAs
TOTAL % REMOVAL

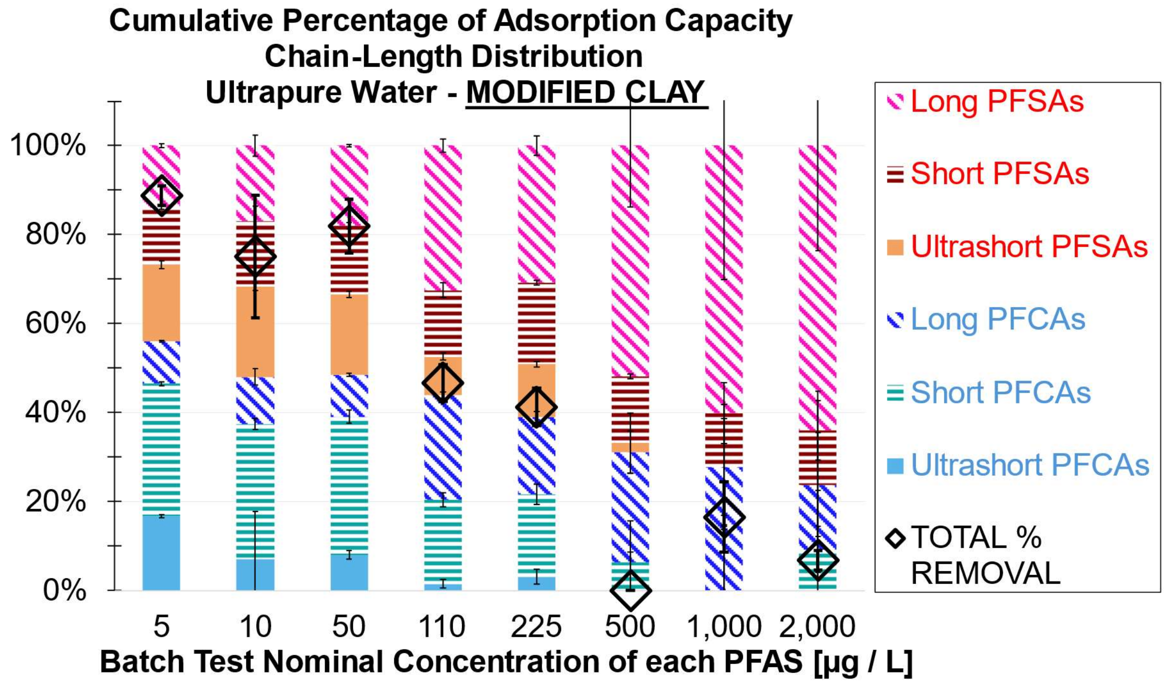


Figure S.19 - Cumulative percentage distribution plots for UP isotherm tests for Norit 1240+ GAC, SMC and PSR2+ IX

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