DEXSORB+ Isotherm and Model Fitting for PFOA, PFOS, GENX
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DEXSORB+ TECHNOLOGY TO REMOVE PFAS

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Overview

The purpose of this work is to systematically investigate PFAS isotherm on DEXSORB+ in a clean water matrix (nanopure water) to provide insights into the adsorption affinity and maximum capacity of DEXSORB+ for PFAS.

By performing batch experiments at a series of representative adsorbent-adsorbate ratios, the complete isotherm of PFOA, PFOS, and GenX have been determined for DEXSORB+. The resulting isotherm data was then applied for the fitting of Langmuir and Freundlich models, of which the fitting results are provided in **Table 1**. The experimental isotherm data along with the fitted curves are presented in **Figure 1**.

According to the fitting output of Langmuir isotherm model, the maximum adsorption capacity of DEXSORB+ for PFOA, PFOS and GenX are 240.9 mg/g, 188 mg/g, and 93.9 mg/g, respectively. The adsorption affinity of DEXSORB+ for all three PFAS are equally promising. These observations demonstrate the great potential of DEXSORB+ for the removal of PFAS during drinking water and wastewater treatment.

PFAS Isotherm on DEXSORB+

Batch experiments were performed on tumblers with a series of representative adsorbent-adsorbate ratios. After the adsorption equilibrium was established (~ 24 hours), water samples were collected, centrifuged, and analyzed with Cyclopure standard methods on HPLC-MS/MS (Thermofisher, QExactive). For each equilibrium point, a total of 6 replicates were performed to 1) quantify the random error resulted from the experimental setup, and 2) guarantee the reliability of each isotherm data point. The resulting data was then employed to fit two common models, Langmuir and Freundlich. The model fitting results for each PFAS are provided in **Table 1**. The experimental isotherm data and fitting curves are presented in **Figure 1**.

Table 1. The isotherm and model fitting output of PFOA, PFOS, and GenX for DEXSORB+.

Compound	Langmuir Isotherm			Freundlich Isotherm		
	K_L[a]	q_{max}[b]	R^2	K_F[c]	n[d]	R^2
Perfluorooctanoic acid (PFOA)	1.11	240.9	0.99	129.2	3.88	0.97
Perfluorooctanesulfonic acid (PFOS)	2.35	187.9	0.98	126.0	5.56	0.94
Perfluoro-2-methyl-3-oxahexanoic acid (GenX)	1.29	93.9	0.96	66.1	8.17	0.96

[a]The affinity constant of Langmuir isotherm model indicates the adsorption affinity of DEXSORB+ for an adsorbate at environmentally relevant concentrations $(L_{solution}/g_{adsorbate})$.
[b]The capacity constant of Langmuir isotherm model indicates the maximum adsorption capacity of DEXSORB+ for an adsorbate at high concentrations. $(mg_{pollutant}/g_{adsorbate})$.
[c]The distribution coefficient of Freundlich isotherm model is determined by the nature of DEXSORB+ $(L_{solution}/g_{adsorbate})$.
[d]The correction factor of Freundlich isotherm model is determined by the nature of DEXSORB+.

Based on Langmuir model fitting output, the superior adsorption affinity and capacity of DEXSORB+ for PFOA, PFOS and GenX have been demonstrated. The q_{max} for PFOA and PFOS are well above 180 mg/g, which outcompete most commercially available adsorbents targeting the removal of PFAS from drinking water and wastewater. Additionally, the DEXSORB+ q_{max} for GenX is also among the highest of all tested adsorbents, suggesting its potential for the removal of short-chain PFAS and PFAS alternatives of rising concerns.

As is known, PFAS and other emerging contaminants generally occur in the environmental at low concentrations (i.e., ng/L to low µg/L). With the values of q_{max} alone, limited insights can be achieved into the efficacy of an adsorbent under real circumstances. According to our results, DEXSORB+ also exhibits high adsorption affinity at low concentrations, represented by K_L for all three PFAS, demonstrating the feasibility of DEXSORB+ in actual drinking water and wastewater treatment.

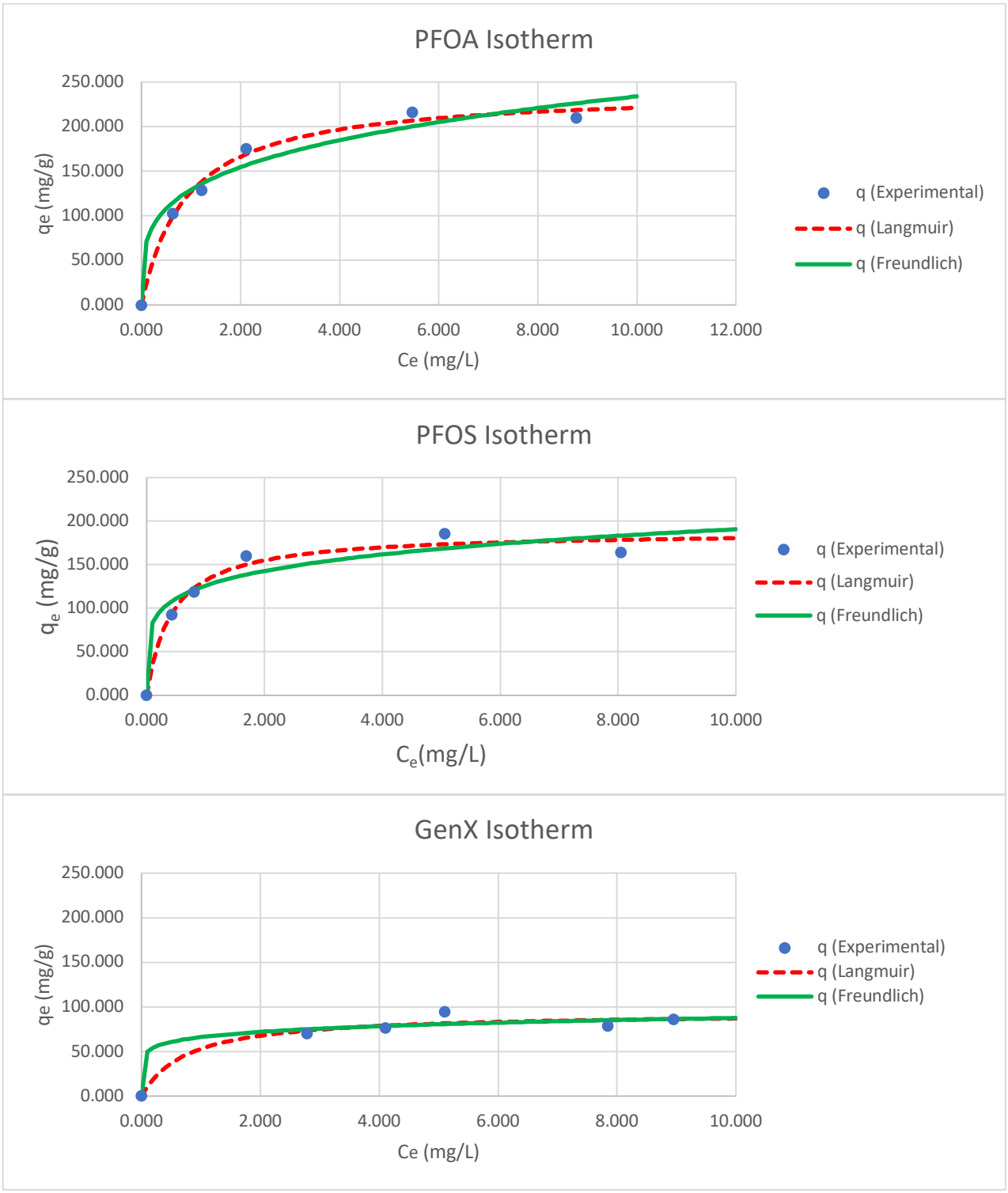

Figure 1. The isotherm of PFOA, PFOS and GenX with Langmuir and Freundlich fitting curves.