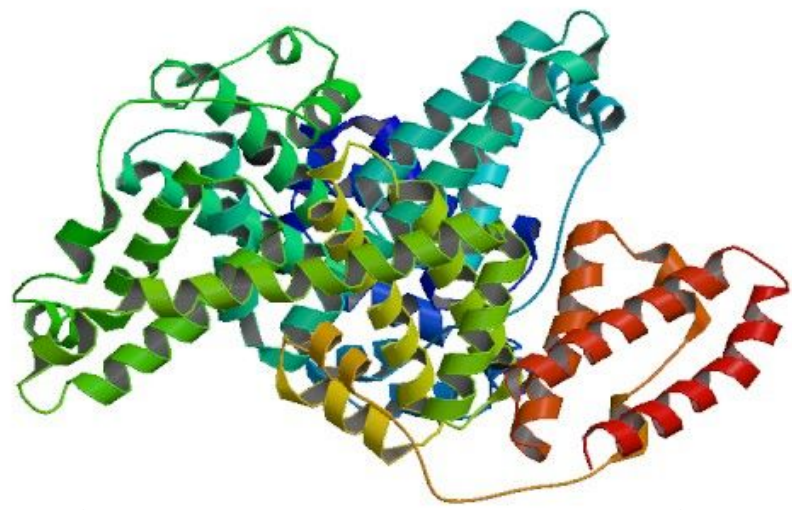


Protein-loaded adsorbents to address aqueous PFAs Pollution

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Overview

This project seeks to design materials that can adsorb perfluoroalkyl and polyfluoroalkyl (both PFAs) substances from our water supply. Several experiments took place in which protein (bovine serum albumin, BSA) loaded materials were mixed under different conditions in order to analyze the removal of PFAs.



Bovine Serum Albumin, BSA protein

Key Findings

In the first trial, Table 1, GO and MNP performed better than LDO, so they were selected for further PFAs removal experiment. BSA loading enhanced the removal of PFBA and PFBS by GO. However it lowered the adsorption of higher chain length compounds. MNP, enhanced the removal of PFBS and PFPeA.

Materials	Removal (%)
Egg NiLa LDO	16.18
GO	29.20
MNP	18.98

Table 1.

Removal Percentage (%)	PFBA	PFBS	PFPeA	PFOS
only GO	0	0	20.42	26.28
GO-BSA	12.44	27.1	17.64	5.54
only MNP	30.65	17.54	11.96	4.18
MNP-BSA	20.06	25.34	15.67	0.00

Table 2.

Methods and Materials

Table 1. To test the removal of PFAs, BSA loading was done on different materials. 50 mg adsorbent material was mixed with 40 mL BSA solution under conditions of 0.6 M NaCl, pH 5

Table 2. Go and MNP tested for the removal of four species of PFAs, 50 mg adsorbent material mixed with 40 mL PFAs solution under conditions of 5 mM NaCl, pH7, and initial conc. 5 mg/L

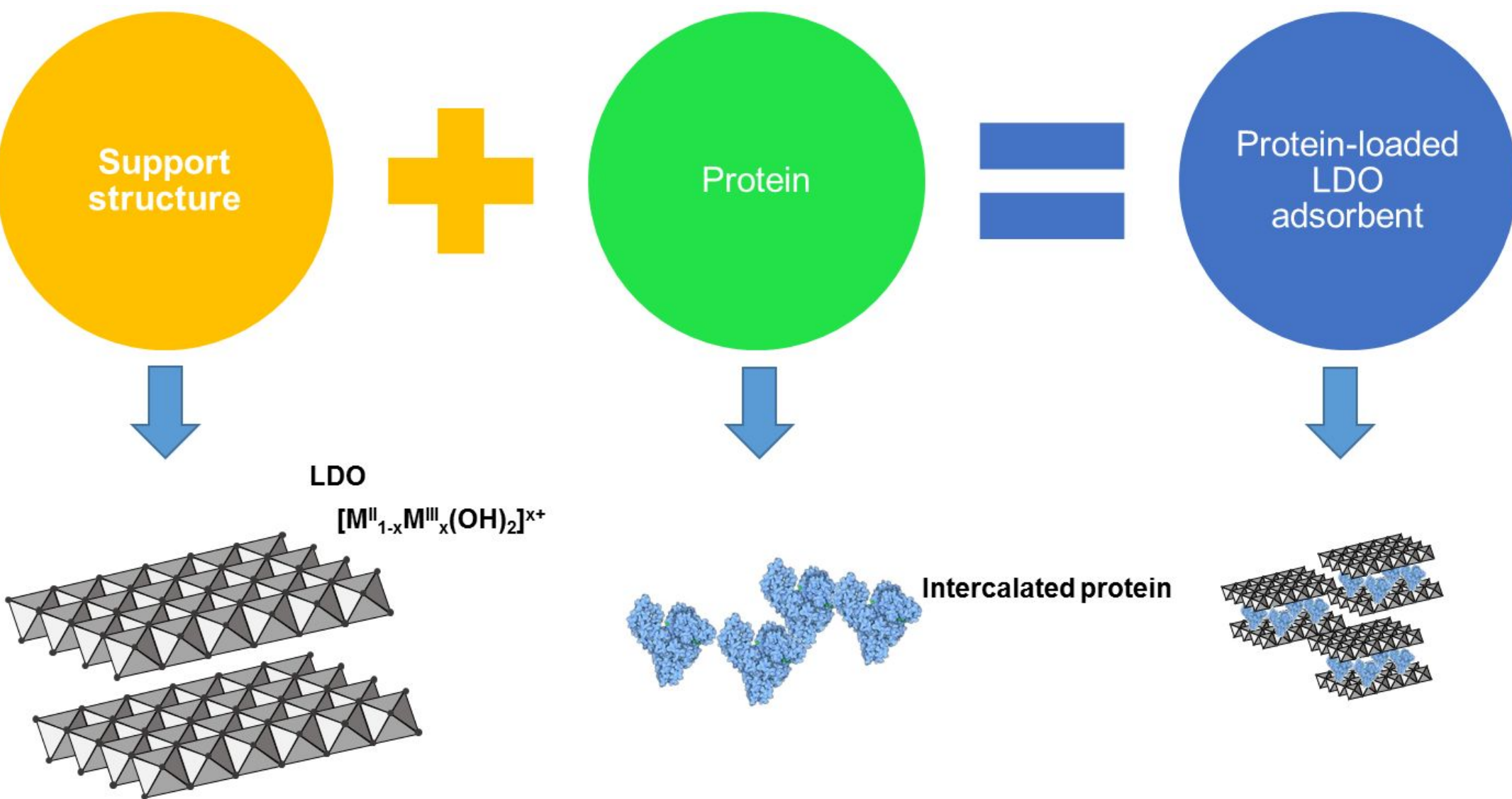


Fig. 1 Loading of BSA and LDO material

Materials Included:

- Bovine Serum Albumin (BSA)
- Graphene Oxide (GO)
- Nickel-lanthanum layered double oxides (LDO)
- Fe₃O₄ Magnetic Nanoparticles (MNP)
- Four PFAs species: PFOS, PFBA, PFBS, PFPeA

Impact

Continuation of this research can reduce PFAs pollution in water, eliminating their carcinogenic properties. Testing with different PFAs requires further research in order to address this issue on a global scale.

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BSA Image: RCSB PDB <https://www.rcsb.org/structure/3V03>

