Removing Persistent PFAS: Implications for Efforts to Group Contaminants



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Physical Treatment: Water (GAC, IX)

- Wellhead/point-of-use treatment
- Municipal water treatment





Fig. 8. Time to breakthrough 10% C/C_o (BVs) for the AE and GAC columns. McLeaf et al. (2017)



Physical Treatment: Immobilization

Ziltek collected PFOS/PFOA containing soil and groundwater samples from a contaminated site in Australia for treatment feasibility trials.

Ziltek's immobilisation reagent RemBind was mixed at various ratios with the soil and water samples, and after 24 hours the treated samples were sent to an independent accredited laboratory for analysis.

Results show that RemBind reduced the leachability of the PFOS/PFOA compounds by up to >99% thus providing a cost-effective solution for the management of these contaminants.







Soil Treatment Results

	PFOS* µg/L	PFOS % Reduction	PFOA* μg/L	PFOA % Reduction
Control	62.5	-	2.7	-
RemBind	0.39	99%	0.12	95%
RemBind Plus	<0.02	>99%	<0.02	>99%

*Australian Standard Leaching Protocol

Water Treatment Results

	PFOS μg/L	PFOS % Reduction	PFOA μg/L	PFOA % Reduction
Control	8,800	-	398	-
RemBind	74.4	99%	28.8	93%



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Chem/Bio Treatment: In Situ Remediation



PFAA Precursors

PFAAs





Chem/Bio Treatment: Pump & Treat



PFAA Precursors

PFAAs





PFCA Precursor Measurement (TOP Assay)



Houtz and Sedlak ES&T, 2012, 46, 9342-9349





Extension of TOP Assay



Zhang et al. *ES&T Letters*, 2019, 6, 662-668





Product Design for Degradability: Refrigerants





Xiang et al. *PNAS*, 2012, 111: 17379-17384



Take Home Points

- Physical Treatment: Adsorption correlated to chain length (anions)
- **Chemical Treatment:** Poly- goes to per-, which is hard to degrade
- **TOP Assay:** May avoid analytical poly- problems
- Next Generation PFAS: Ethers, chlorines, alkyl groups



