Texas A&M AgriLife Research

Grant Information: Institution, Principal Investigator(s), Contact Information, Grant Number	**Texas A&M AgriLife Research** **Project:** Efficient Bioremediation of Environmentally Persistent Contaminants With Nanomaterial-Fungus Framework (NFF) **Project Leaders**: Susie Dai, Joshua S. Yuan (Texas A&M University), Gregory V. Lowry (Carnegie Mellon University) **Funding Period:** 2021-2025
Technology	The project develops a biomimetic sorbent derived from plant cell walls, which can adsorb persistent organic pollutants, such as PFAS, and present the contaminants-enriched biomass to fungus for bioremediation. The technology can potentially eliminate the treatment train approach and consolidate the pollutant removal and degradation sequentially in the same space.
Innovation	**Materials:** The bioremediation system utilizes 1) a material derived from lignocellulosic biomass and functionally modified to adsorb contaminants such as PFAS. **Biological:** The fungus utilizing the biomass and the organic contaminants as the carbon source. **Why is this technology/approach different than what is already in the market?** Our design uniquely differs from the other state-of-the-art, in that our sorbent is more than a media but an interactive component in a sustainable bioremediation system.
Contaminant and Media	**Contaminants and Media:** The technology targets water and media that can be treated by fungus.
Expansion Potential	**Looking Forward: What other contaminants/media would work for your technology?** The technology synergistically renders innovative sorbents for contaminant enrichment and fungus species that can efficiently degrade persistent contaminants. **Combined Remedy: Would this technology work well with other treatment approaches?** The two outcomes can be applied in a combined fashion or separately.
Sites/Samples	We will sample an Air Force base site in San Antonio, Texas. We will take water and soil samples. The water sample for treatment and the soil sample for isolating microbes that can potentially be useful for PFAS.

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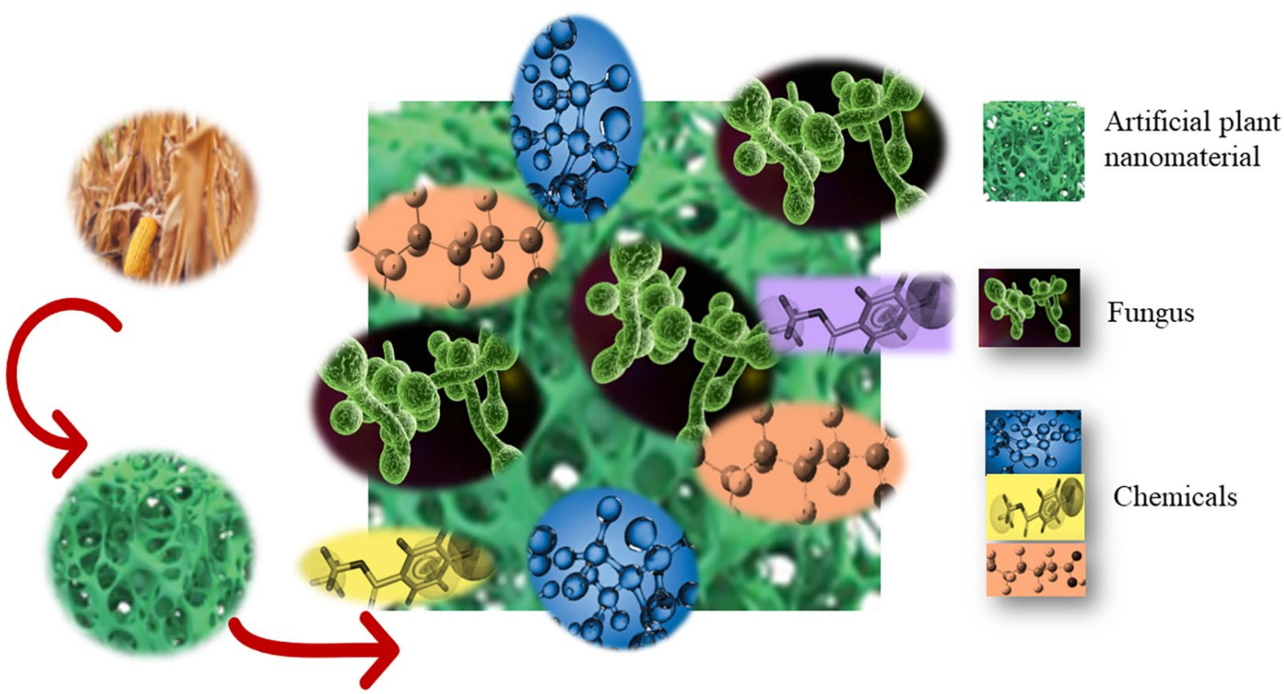
Technology Readiness Level	TRL 4 — Technology validated in laboratory
Update of Progress	The material exhibits record absorption capacity for the PFAS compounds, perfluorooctanoic acid (PFOA) at 3529 mg/g, and perfluorooctanesulfonic acid (PFOS) at 4151 mg/g. At the same time, the material sustains fungal growth and serves as the sole carbon source for the microbe. Publications from this project: • Yu J et al, 2023. Genomic diversity and phenotypic variation in fungal decomposers involved in bioremediation of persistent organic pollutants. J Fungi 9(4):418. • Li J et al, 2022. Sustainable environmental remediation via biomimetic multifunctional lignocellulosic nano-framework. Nat Commun 13(1):4368. • Zhang W et al, 2022. Design of biomass-based renewable materials for environmental remediation. Trends Biotechnol 40(12):1519-1534.



Illustrative presentation of the system design. PFAS are adsorbed into the biomimetic plant material. When the fungus consumes the plant material, it also eats the chemical that was adsorbed.