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Development of a reductive defluorination reactor for PFAS destruction

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Per- and polyfluoroalkyl substances (PFAS) are increasingly being detected across a wide range of environmental compartments, as a result of their decades of use in a range of industrial, firefighting, and consumer applications. This presentation discusses efforts to develop a reductive defluorination reactor for the destruction of a wide range of PFAS. Using Granular Activated Carbon (GAC) as a reactive platform, we modified the surface chemistry of this affordable electrically conductive adsorption matrix with existing electrochemically active catalysts of reductive dehalogenation reactions (e.g., vitamin B12, metal-porphyrin complexes and single atom catalysts). A range of electron sources are trialled, including an external power supply, nanometals and a microbial community. The reactor simultaneously immobilizes and defluorinates PFAS in contaminated water bodies (i.e., a ‘trap and treat’ approach). This technology is also scalable, such that it can be used to treat significant quantities of contaminated water. Given this the proposed water treatment system could help address many of the pressing concerns facing water treatment operators.