Evaluating the Efficacy of a Novel BIOPAC Bio-Adsorbent for the Removal of Aqueous Per- and Polyfluoroalkyl Substances (PFAS)

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Approximately 98% of Americans have detectable levels of per- and polyfluoroalkyl substances (PFAS) in their blood. These “forever chemicals” have been recognized as emerging contaminants in various water sources, posing serious health risks due to their common use in consumer and commercial applications. There is a growing need for efficient methods to remove PFAS from contaminated water sources. While conventional techniques are efficient, they have drawbacks, particularly when targeting short-chain PFAS, which are more difficult to remove from water. These methods are also more expensive, making them less practical for widespread application. This study introduces a novel approach to the effective removal of PFAS from aqueous media through the use of an activated charcoal biochar composite with agricultural residue biomass called BIOPAC (biochar-infused organic PFAS adsorption composite). The goal of this research was to develop a low-cost, eco-friendly solution with high adsorption capacity for both short-chain and long-chain PFAS compounds. Rapid small-scale column tests (RSSCTs) were conducted to assess the performance of BIOPAC compared to biochar and biomass individually. The results demonstrated that BIOPAC outperformed the other tested materials, achieving up to 100% removal of PFBA, a short-chain PFAS, due to its high adsorption capacity and affinity for PFAS, especially short-chain compounds. These findings highlight BIOPAC's potential as a cost-effective solution, projected to cost only $3.00 to produce compared to other filtration systems, such as carbon filters, which can cost up to $100. This sustainable solution for PFAS removal from water offers future applications in household water filters and large-scale remediation efforts.

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