[Poster presentation]

PFAS Removal Characteristics based on Carbonaceous Properties of Activated Carbon

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ABSTRACT

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Contents

Per- and polyfluoroalkyl substances (PFAS) are widely used in the chemical and electronic industries due to their stable structure and properties such as heat resistance and hydrophobicity, which also make them difficult to degrade and detect in aquatic environments. Activated carbon (AC) is considered one of the most effective materials for PFAS removal, however, the domestic supply of coal-based AC is entirely dependent on imports has recently been restricted due to strengthened air pollution regulations. This study aims to enhance PFAS adsorption efficiency by analyzing the carbonaceous properties and surface characteristics of bio-based AC. The surface properties of AC were Microporous coconut-AC is more likely to block pores than mesoporous AC, which interrupts the adsorption of short-chain PFAS. The highly negative zeta potential of bamboo-AC induces electrostatic repulsion with negatively charged PFAS, especially the short-chain group. Therefore, when bamboo- and coconut-AC were mixed, bamboo-AC can selectively reduced long-chain PFAS, which would otherwise adsorb onto the surface of coconut-AC and cause pore blocking. Additionally, a uniform micro- and mesopore ratio contributed to enhancing overall adsorption efficiency. The optimal mixing ratio determined from batch experiments was applied to the column test. In the early stage of column operation, short-chain PFAS were removed effectively. The short-chain compound PFBA reached breakthrough within three days, and the effluent concentration exceeded the influent's due to displacement of PFBA by longer chain PFAS. Although PFBS has not reached breakthrough during the operation period, it is expected to be the first among PFSAs to achieve breakthrough at 58k BV. Therefore, it is necessary to develop strategies for stable PFAS removal and to continue research on activated carbon and the PFAS adsorption mechanism.

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