Designing an Activated Carbon Filter to Reduce Water Contamination From Fire Water Runoff

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During many industrial fires, the chemicals released from the incineration of materials inside the building and ones commonly used by firefighters to extinguish the fire are often picked up by water and transported to the nearest storm drain. Fire water runoff (FWR) entering the water supply has been shown to cause significant harm to aquatic ecosystems and human health. The most dangerous of these chemicals are per- and polyfluoroalkyl substances (PFAS). Exposure to PFAS is linked to damaging health effects in animals and humans. Firefighters commonly use aqueous film-forming foams (AFFFs) to extinguish fires, and they contain PFAS. The lack of current solutions to prevent FWR from entering the water supply inspired me to design a filter sock that firefighters can quickly deploy around a storm drain in a firefighting emergency. This study designed the filter by selecting the material and filter media to be used. A woven cotton material was chosen due to its permeability, heat resiliency, and low reactivity with chemicals produced in a fire. Granular activated carbon (GAC) was chosen due to its sustainability and proven high removal efficiency of contaminants in FWR, including PFAS. Firefighters and other disaster responders could implement the filter I designed to prevent toxic pollutants from entering the water supply and protect marine life and humans from these chemicals.

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