Urban and Rural Fire Disasters: Engineering and Testing of Novel Alg/Cs/BET 'Beads for the Rapid Abatement of Post-Fire Waterborne Pollutants

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Water pollution is a global issue, with sources ranging from industrialization and agricultural activities, to natural disasters like wildfires. These fires are especially concerning as they release toxic pollutants into the environment through ash and burned materials. These natural disasters often release waterborne contaminants faster than can be practically contained. To combat the dangerous contaminants released by megafires, this study has experimentally investigated the development of a natural bio-sorbent to remove chemical and metallic pollutants from aqueous environments in a timely and practical manner. Experimentation involved formulating bio-sorbent beads using natural ingredients. Alg/Cs/BET among other additives were selected for their adsorption/absorption abilities, compatibility, and sustainability; many were extracted from green waste to promote cost-effectiveness and eco-friendliness. Bio-sorbent Alg/Cs/BET beads were created for practical and speedy distribution to contaminated sites. Beads were soaked in the contaminated solutions and analyzed after 72 hours. Pollutant removal was assessed using a Total Dissolved Solids (TDS) meter and a spectrophotometer to measure changes in concentration. Results showed that formulations reduced pollution levels in Copper Sulfate by 40%, Wildfire Ash by 56% and Methylene Blue by 100%. An ANOVA Statistical test was conducted to compare the effectiveness of the different formulations with p-values below 0.05 for the Copper Sulfate, Methylene Blue and Wildfire Ash tests suggest significance of the results. The findings support the potential of sustainable biosorbents as a viable solution for post-wildfire water remediation and suggest their greater application in similar situations.

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