Analyzing the Mechanism and Efficiency for Filtering Pb Using Fresh Water Algae, Phase Three

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Lead contamination is a huge issue in our global society. The first two Phases of this project involved designing, fabricating, and optimizing a Wet Algae Mechanical Filter (WAMF). Phase 3 focused on both measuring the efficiency and determining the chemistry of the lead-algae interaction. The project determined the capacity of algae to remove lead contamination from water and substantiated that sulfur in the algae is bonding with the lead, causing it to be removed. Samples were prepared using the WAMF which forces contaminated water through an algae cake. Two types of tests were preformed. One varied the mass of algae charge in the filter and the other varied the volume of contaminated solution passed through a single algae charge. The data collected was analyzed, presented graphically, and from the best fit line, an effective capability was calculated. Results showed that, for every one gram of algae, 71ppb of lead was removed from a liter of water. The ratio was determined for algae (chlorophyta) found in a local pond. Lead removal is limited by the finite amount of sulfur in the algae. Iodometric titration methods were used to confirm the presence of sulfur in the algae and determined the sulfur amount available to react with the lead. This engineered process can be applied to remediate current and future instances involving environmental lead contamination such as the Flint Water Crisis. These findings are a very important step towards clean water in our world. The final objective of this effort is to engineer, build, test, and demonstrate a full-scale system capable of being used to provide lead-free water to a small rural community anywhere on the globe.

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