Development of a Low-Cost Highly Efficient Filter for Heavy Metal and Organic Contaminant Removal

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The size and complexity of e-waste is increasing at a much faster rate than the efficiency of our strategies to contain it. Lake Chivero is heavily polluted with metal ions and is the main source of water for the capital city of Zimbabwe. We tested out a novel method of remediation of heavy metal ions from water that can highly promise relief to locations plagued with heavy metal pollution. We worked on developing a nano-scalable, highly efficient and reusable filter made of polydopamine (PDA), a nature-inspired biopolymer that can form coordination bonds with metal ions. The PDA membrane was synthesized using dopamine hydrochloride, ammonia and ethanol. The particles were centrifuged and the hydrogels were dried. A conventional vacuum filter was set up. Concentrations of ions such as copper, zinc and iron in water samples were evaluated before and after filtration using an Atomic Absorption Spectrometer. The membrane was regenerated using sodium citrate. As a result of the high electron affinity of the active catecholamine group as well as the pi-pi interactions between PDA and other molecules, the membrane can absorb close to 99.8% of heavy metal ions. Polydopamine is non-toxic and environmentally friendly. Its high absorbance efficiency and recyclable property will aid in reducing the country's expenditures on water treatment of heavy metal ions as this can replace the expenseive methods of purifying water by *chemical precipitation*. As a result, the reduction in costs on treating water can be now invested into improving the sewer systems to reduce waste and heavy metals from contaminating the water.

Awards Won:
U.S. Agency for International Development: USAID Science for Development First Award - Climate and Environmental Protection