Making Removal of Chemical Contaminants in Drinking Water Affordable and Available Anywhere and Everywhere

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The project's goal was to create a methodology for a low-cost, easily reproducible way to purify water because lack of clean drinking water is a deadly problem, especially in the developing parts of the world. Preliminary analysis of materials such as single-wall and multi-wall carbon nanotubes, graphene, chitosan, zeolite, and activated carbon as possible candidates for adsorption, revealed that activated carbon is the best fit. A homemade kiln was designed and improved for higher maximum temperature. Several endemic plants were selected to produce activated carbon. An apparatus was designed to pass steam through the carbon. The effect of acid and base pretreatments was studied. A pretreatment with fermentation also was studied. The adsorption surface area offered by the activated carbon samples was determined using Iodine adsorption and titration of the remnant solution against sodium thiosulfate. Heat, steam, acid, base, and fermentation all improved the adsorption surface area. The best samples produced had a surface area of about two-thirds of the commercially available activated carbon. The concentration of heavy metals and negative polyatomic ions was reduced much below the EPA established limits. However, the most important observation was that the improvement in surface area and ion removal was significant irrespective of the plants and number or nature of pre-treatments. Any deficit could easily be compensated by increasing the length of the purification column. Hence, the project proved that a simple one-page methodology that uses locally available materials could improve the quality of water people worldwide consume.

Awards Won:

Ricoh USA, Inc: Ricoh Sustainable Development Award of $10,000