Low-Cost Gravity Driven Filtration System Designed Using Iron Oxide Nanoparticle-Loaded PU Foam for Arsenic Removal from Polluted Water in Developing Countries

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Arsenic contamination of water sources is a global problem, affecting numerous countries across the world. Natural weathering and anthropogenic sources, such as mining and use of coal-fired power plants, leads to the exacerbation of this issue, most significantly affecting populations of developing countries. With lack of thorough government intervention and support, exposure to exorbitantly high concentrations reaching 400 parts per billion (ppb) of arsenic in water sources lead to numerous health complications, including the development of respiratory, neurological, and cancerous diseases. This study focused on developing an innovative, low-cost, and gravity driven filtration system using a novel iron oxide nanoparticle-loaded polyurethane (PU) foam by which people in developing countries have easy access to an effective yet affordable and easily manufacturable filtration system. After successfully synthesizing the new iron oxide nanoparticle- loaded PU foam, effectiveness of the foam was tested by developing a filtration system of PVC tubing with 10 and 20 cm of PU foam at the end of two separate models respectively. Samples of arsenic contaminated water with known concentrations of 100 and 200 ppb were run through each of the systems numerous times. The system with 20 cm of PU foam was able to successfully filter out around 50-70% of the arsenic from the 100 and 200 ppm samples, thus highlighting the model and material's potential at meeting currently marketed filtration system's filtering capabilities for a lower production price.

Awards Won:

Fourth Award of $500

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