Preparation of Environmentally Friendly Adsorbents for the Treatment of Water and Development of an Innovative Treatment Method ‘Stick Sieve'

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In this era of water scarcity, water purification has become an important issue. Our aim is to contribute to both the ecosystem and the economy by preparing a novel treatment method and green adsorbents that can solve this problem. We used human hair, banana peels, and pine leaves, which are classified as waste, and coated these materials with nano-sized magnetite. We also developed an innovative treatment method. For the prototype, we put magnetite-hair adsorbent in the sieve, and rolled it into a tubular shape. Since we achieved the highest removal efficiencies, we continued the experiments with hair. SEM-EDX analyses confirmed the nano structure formed in and on the hair strands. We determined the surface pH of the adsorbent and the optimum adsorption conditions for fourteen toxic elements. We used isotherm and kinetic models. The results indicated that the adsorptions were favorable and physical. For visual proof, we immersed the prepared stick sieve adsorbent in the nickel solution and mixed it. We observed that the pink color formed by nickel with dimethylglyoxime was completely removed in only 5 minutes. We carried out validation studies with certified water samples and spiking methods and achieved high removal and recovery efficiencies (about 100%). As a solution to the problems encountered in water purification systems, we developed a novel system ‘Stick Sieve’, which does not need to stay in water for a long time, does not cause negative effects such as algae formation, and has a high capacity. Furthermore, it is small, makes fast adsorption, and can also adapt to all kinds of containers.

Awards Won: