

Selective Heavy Metal Capture Using Functionalized MOFs

A Breakthrough in Water Purification

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This research explores the use of special materials, known as MOFs, to effectively remove harmful heavy metals from contaminated water. MOFs, characterized by their porous structure and large surface area, offer a unique ability to trap pollutants. We synthesized MOFs with specific chemical components that attract and bind to heavy metals such as lead, mercury, and arsenic. Using laboratory techniques, we confirmed the successful creation of these specialized MOFs. When tested in water containing heavy metals, the MOFs demonstrated remarkable efficiency, removing over 99% of the pollutants. They exhibited a significantly higher capacity to hold heavy metals compared to traditional materials. Furthermore, the MOFs showed excellent selectivity, effectively capturing heavy metals even in the presence of other substances. We also investigated the reusability of the MOFs, finding that they maintained their effectiveness after repeated use. A prototype water filtration system incorporating these MOFs was developed and tested, demonstrating its ability to purify water effectively. The projected cost of this MOF-based filtration system is significantly lower than current methods like reverse osmosis. This study highlights the potential of MOFs as a cost-effective and sustainable solution for water purification, offering a practical approach to addressing the global challenge of providing access to safe drinking water.