Researchers at the University of South Florida have developed porous organic polymer (POP)-based mercury nano-traps that can efficiently remove mercury from aqueous solutions and flue gases.

Mercury (Hg) pollution, which can cause birth defects, brain damage, and disease in humans and other species, has long been a threat to public health and environment. The release of mercury into the environment is mainly due to discharge from industry products, byproducts and processes. A global agreement has recently been reached that aims to reduce mercury contaminants, which has spurred research to remove and recover mercury ions from industry waste water. Among various technologies developed over the years for mercury removal, absorption holds great promise due to the simplicity and relatively low-cost of absorption technology as well as the effectiveness of absorption methods to purify water. Up to now, existing absorbent materials still face all sorts of challenges like low surface area, moderate affinity for Hg(II), and poor stability in a wide pH range, which have largely limited their effectiveness for the removal of Hg (II) from aqueous solutions. These weaknesses necessitate the development of new types of materials for improved Hg(II) removal.

Our inventors have tackled these challenges with a novel POP-based mercury nano-trap that features high Hg(II) absorption capacity, high affinity for Hg(II), controllable kinetics of Hg(II) absorption, and exceptional water/chemical stability that facilitates regeneration and recyclability. The POP-based mercury nano-trap was afforded by functionalizing PAF-146, an amorphous POP that exhibits very high surface area and includes thiol groups that are well-known to bind Hg(II) strongly. This mercury nano-trap exhibits an improved mercury saturation uptake capacity of over 1000 mg g⁻¹ and can efficiently remove >99.9% mercury within a few minutes.

The novel aspects of this invention provide a new perspective for decontaminating Hg(II) from aqueous media, and can also be readily applied to capturing other heavy metal ions from contaminated water for environmental remediation.

**ADVANTAGES:**

- Exhibits record-high saturation mercury uptake capacity
- Retains high effectiveness for mercury removal over a broad pH range
- Maintains high mercury absorption capacity upon regeneration and reuse

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