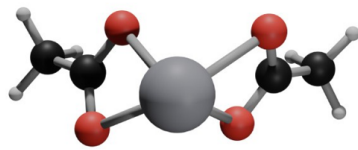


Porous Metal Phytate Coordination Polymers for Decontamination



Calculated binding mode of Pb with acetate groups. The structure was obtained from a CIF file of $\text{Pb}(\text{CH}_3\text{COO})_2$ and then relaxed using DFT calculations. The binding energy of Pb with the two acetate groups was calculated to be $-1,131 \text{ kJ/mol}$.

Ref. Nr

6.2731

Keywords

perovskite; decontamination;
lead; polymer

Intellectual Property

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Description

Researchers developed a zirconium-phytate coordination polymer (Zr-PA), a low-cost and environmentally friendly adsorbent synthesized at room temperature using a bio-based monomer and water. Zr-PA shows superior performance in removing lead (Pb^{2+}) from water, outperforming commercial ion-exchange resins in selectivity, adsorption capacity, and reusability, even when many competing metal ions are present. It can remove $\geq 90\%$ of lead at very low concentrations (1 ppm) where commercial resins remove $< 50\%$.

The material is highly chemically stable, tolerating strong acids, and can be easily regenerated with 1 M HCl, maintaining performance over multiple cycles.

Beyond water treatment, Zr-PA can capture over 99% of lead leaked from perovskite solar cells, helping address a key environmental concern for their commercialization.

Similar iron- and cerium-phytate materials (Fe-PA and Ce-PA) show comparable performance. Post-synthetic modifications further improve adsorption capacity and functionality.

Advantage

phytate-based metal coordination polymers provide a sustainable, highly selective, and reusable solution for lead removal in water and for mitigating lead leakage from perovskite solar cells

strong lab-scale performance, significantly outperforming commercial resins in terms of selectivity, adsorption capacity, chemical stability, and reusability

Applications

Lead capture from liquids (such as industrial leakage, solar panel leakage, water decontamination)