

BUSINESS OPPORTUNITIES

Heavy metals adsorbent for water purification

An innovative super porous adsorbent with enhanced removal capacity toward heavy metal water contaminants



BACKGROUND

The recent surge in the demand for accessible water for industrial and drinking use, coupled with the alarming increase of toxic pollutants in the environment, have driven a search for efficient, economic and sustainable water purifying methods. Heavy metal ions are among the most widespread contaminants for both drinking waters and industrial wastewater and exposure to even traces of these metals can result in chronic health disorders.

The most common water remediation strategies currently adopted include reverse osmosis, filtration and chemical precipitation. Most of them, though, are not effective with low pollutant concentration or require high maintenance costs and large complex equipment. Approaches based on adsorption and molecular sieving are widespread due to their simplicity, efficiency and low costs; however, most adsorbents have drawbacks such as limited regeneration, slow sorption kinetics, relatively low thermal or chemical stability, and limited selectivity.



TECHNOLOGY DESCRIPTION

ICN2 researchers developed an innovative **super porous adsorbent** with enhanced removal capacity toward heavy metal water contaminants. This adsorbent is a novel composite material of metal-organic frameworks (MOF) and cerium oxide (CeO_2) inorganic nanoparticles, featuring excellent porosity and chemical stability. The composite has been designed to combine the high surface areas and adsorption properties of both MOF and inorganic nanoparticles, thus it can **simultaneously remove different heavy metals** from water, such as **As(III and V), Cd(II), Cr(III and VI), Cu(II), Pb(II) and Hg(II)**.

This material is fabricated by spray-drying in the form of spherical microbeads, which can be further structured into millimetric granules, making it suitable for water purification systems such as cartridges for point-of-use usage, or even in continuous flow fixed-bed adsorption columns for scale-up applications. Moreover, the adsorbent capacity can be regenerated by simple acidic treatment, allowing for recyclability of the material and process sustainability.

KEY ADVANTAGES

- ▶ Cost-efficient and scalable production, thanks to spray-dry process
- ▶ Low cost starting materials
- ▶ Simultaneous removal of multiple heavy metals
- ▶ Tunable beads shape and size up to millimetric granules
- ▶ Ease of material regeneration
- ▶ Chemical stability
- ▶ Suitability to a wide range of filtration systems

STAGE OF DEVELOPMENT

A functioning prototype of this technology has been developed and used to carry out proof-of-concept evaluations. The composite proved to be efficient toward metals removal from artificial and real samples of heavy-metals rich waters.

The invention is protected by a European Patent application (EP19382968) filed in 2019.

BUSINESS OPPORTUNITY

This invention can appeal to companies fabricating adsorbents and molecular sieves (such as active carbon, zeolites, etc.), manufacturing purification devices or systems for water purification or remediation.

We are looking for industrial partners interested in licensing the technology and/or collaborating to industrial prototyping and testing in relevant environment.

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