Researchers propose new approach for harmless disposal of phosphogypsum

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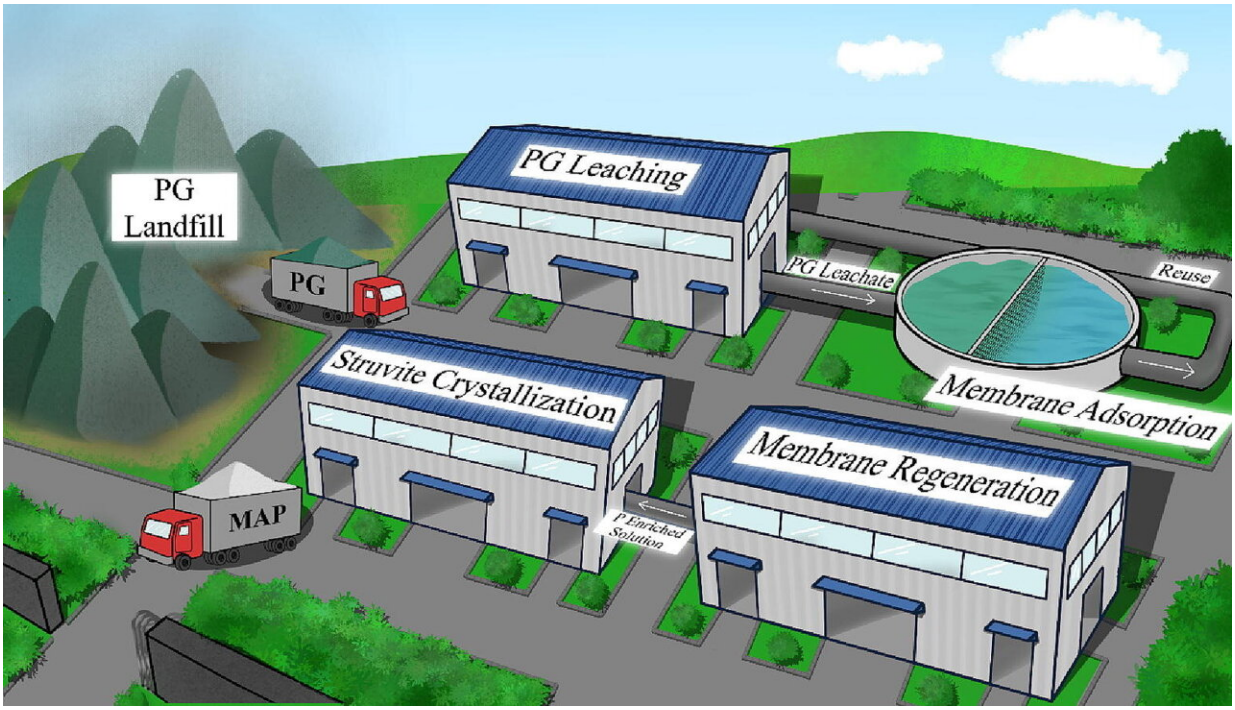

Schematic illustration of phosphorus recovery from PG leachate. Credit: IGCAS

At present, more than 6 billion tons of phosphogypsum (PG) accumulates worldwide, with an annual growth of ~280 million tons. More than 60% is stored in mountains. Phosphorus pollution from PG due to rainwater immersion has caused serious water environment and ecological problems. Efficient phosphate recovery and resource

utilization techniques are crucial to solving this problem.

Recently, a research group led by Prof. Chen Jingan from the Institute of Geochemistry of the Chinese Academy of Sciences (IGCAS) has recovered phosphorus resources from PG efficiently by zirconium membrane-triggered adsorption and struvite crystallization, and clarified the detailed mechanisms of separation and purification of phosphate down to atomic scale. The work was published in *Chemical Engineering Journal* on June 29.

"Adsorption-complexation is the main purification mechanism of phosphate with the new zirconium membrane. These membrane materials can be recycled to effectively reduce process costs," said Prof. Chen.

The researchers found that more than 90% of the active phosphorus components in PG could be efficiently recovered through the adsorption process triggered by the new zirconium membrane, and simultaneously realize the harmlessness of PG. The desorbed and concentrated phosphate radicals are then prepared into high-value agricultural fertilizers.

The findings of this study not only demonstrate a novel approach to realize efficient resource utilization of PG, but also provide insights for pollution control and comprehensive utilization of PG in karst regions and even the world.

More information: Xinping Hu et al, Phosphorus recovery and resource utilization from phosphogypsum leachate via membrane-triggered adsorption and struvite crystallization approach, *Chemical Engineering Journal* (2023). DOI: 10.1016/j.cej.2023.144310