

# MODIFIED BAUXITE FOR PHOSPHATE RECOVERY AND RECYCLING

Tech ID: 32498 / UC Case 2022-017-0

## BRIEF DESCRIPTION

This technology shows three different forms of bauxite to be effective adsorbents for phosphate ions.

- » 1. Mildly processed bauxite (MPB), which is essentially ball-milled raw bauxite ore,
- » 2. Thermally activated bauxite (TAB), which is ball-milled bauxite ore subjected to 300 C roasting, and
- » 3. Acid treated thermally activated bauxite (ATAB), which is ball-milled bauxite ore subjected to 300 C roasting and subsequent acid treatment using 5M HCl.

These three different forms of bauxite are shown to adsorb phosphate in high amounts from solutions containing a range of initial phosphate concentrations, 5 ppm to 631 ppm.

- » ATAB shows the highest adsorption density, demonstrating a value of 50 mg of PO<sub>4</sub>-/g ATAB at pH=6
- » TAB shows an adsorption density of 25 mg PO<sub>4</sub>-/g TAB at pH=6

There are two industry standard materials for phosphate adsorption, activated magnesia (MgO), and activated alumina (Al<sub>2</sub>O<sub>3</sub>). For comparison, activated magnesia (MgO) demonstrates an adsorption capacity of 25 mg PO<sub>4</sub>-/g at pH=6. Activated alumina (Al<sub>2</sub>O<sub>3</sub>) shows an adsorption capacity of 11 mg PO<sub>4</sub>-/g at pH=6 (reference: Journal of Environmental Chemical Engineering 5 C(2017) 3181–31893183).

Phosphate, a finite and dwindling resource mined from phosphate rock, is a critical nutrient in modern agriculture, which is applied as fertilizer to ensure adequate plant growth. The inventors provide a cost-effective, environmentally-friendly method for recovering phosphate from agricultural runoff and other wastewater and delivering the recovered phosphate in a targeted and controlled manner to agriculture and farm sectors.

## SUGGESTED USES

Suggested uses include:

- » column based adsorption for **directed water treatment to remove phosphate loading of wastewater discharge**
- » preloading of adsorbent pellets for **controlled release of phosphate as fertilizer**
- » incorporation into composite electrode for **electrochemically-assisted phosphate removal**
- » batch process by mixing the adsorbent, for **treatment of site-specific waters for phosphate capture**

## ADVANTAGES

In comparison to all commonly used industrial standard adsorbents, this modified bauxite technology:

- » is cheaper
- » is more carbon friendly
- » is environmentally friendlier because of little to no chemical processing
- » has equal or better capacity for phosphate adsorption

## RELATED MATERIALS

## CONTACT

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## INVENTORS

- » Gadgil, Ashok J.

## OTHER INFORMATION

### CATEGORIZED AS

- » **Agriculture & Animal Science**
- » **Nutraceuticals**
- » **Engineering**
- » **Engineering**

### RELATED CASES

2022-017-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

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