

## Water Waste Removal using Magnetic Nanoparticles (#6869)

### *Particles designed to absorb phosphorous in water*

Inventors at Georgia Tech have developed aluminum doped magnetic nanoparticles (MNP) that are designed to adsorb soluble phosphorus in water. The invention ultimately provides materials and a novel method for capturing soluble phosphorus with the MNP and then capturing the MNP-phosphorus complex with a magnet. The absorption process is very specific and clean even in the presence of other inorganic compound and organic matter. This invention not only enables the removal soluble phosphorus from wastewater without needing to apply a secondary physical, chemical or biological method, it also enable phosphorus to be recycled for other purposes. The phosphorus removal efficiency of this invention alone provides a process that out classes other methods in practice in terms of economic efficiency, but the ability of the process to enable recycling of phosphorus also creates economic value as there is a projected increase in demand for phosphorus accompanied by an anticipated decrease in supply. No other phosphorous wastewater removal method provides the superior performance and the dual economic benefit of this invention.

### **Benefits/Advantages**

- **Fast** - The adsorption process only takes 30 minutes, and the treatment process only requires one step (i.e. no filtration).
- **Economical** - The method of preparing the magnetized nanoparticles is simple and cost-effective. Furthermore, a given batch of nanoparticles can be reused more than 20 times, with a 90% recovery rate.
- **Green** - This does not introduce harmful chemicals, and enables the recovery and recycling of phosphorous.

### **Potential Commercial Applications**

- Municipal Wastewater Treatment - for purifying water
- Industrial Wastewater Treatment - fertilizer manufacturing, for example

### **Background/Context for This Invention**

Eutrophication is a condition that can occur in aquatic environments and make the affected area uninhabitable. Phosphorus removal from municipal and industrial wastewater treatment plants is important and necessary for preventing eutrophication in surface waters. Phosphorus removal from wastewater is usually achieved by physical, chemical or biological methods, or some combination of the three. However,

all of these methods have undesirable drawbacks related to either cost or performance, which creates an opportunity to advance the art.

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## **More Information**

### **Publications**

**For more information about this technology, please visit:**

<https://licensing.research.gatech.edu/technology/water-waste-removal-using-magnetic-nanoparticles>

Images:

The automated sequential delivery of multiple fluids. A varying number of delay gates imprinted in the branches are shown in the figure.

COVID-19 and flu saliva test on paper: (A) The automatic sequential delivery of multiple reagents required for virus test; (B) Water pouring into the device triggers the virus assay, allowing the presence of SARS-CoV-2 and influenza A & B viruses to be visually identified by the color changes in the corresponding detection spot

