Easily-manufactured liquid core capsules can be regenerated after use

Categories | Cleantech & Environment, Water Technologies
Development Stage | Proof of concept, ongoing research, ready for industrial scale-up
Patent Status | Patent application filed in the United States

- The use of metals and chemicals in process industries results in the generation of large quantities of effluent containing high levels of toxic heavy-metal ions.
- Conventional treatment technologies for the removal of heavy metals from aqueous solutions are expensive and generate large quantities of toxic chemical sludge.
- Naturally occurring cross-linked alginate gel capsules may be used to eliminate metal ions from effluent although these capsules have already utilized part of their ability to adsorb heavy metal ions.

Our Innovation

Novel single-step process for producing liquid-core capsules having a new and unique fluid core surrounded by a membrane composed of a different polymer. Capsules efficiently adsorb heavy metal cations and can be regenerated several times after use.
Novel capsule containing liquid core

**Key Features**

- Novel capsule contains a unique liquid phase polymeric formulation at its core and a solid or semi-solid hydrocolloid membrane shell.
- This type of capsule has never previously been produced.
- Simple, low-cost production process
- The thin membrane of the liquid-core capsule decreases the diffusion times of the heavy metal cations into the capsule.
- The hydrocolloidal polymeric shell membrane can be further crosslinked to increase its mechanical strength.
- The capsules are almost perfectly spherical.
- Capsules with the sorbed heavy metals may be regenerated after use through at least three regeneration cycles.
- In adsorption experiments, the lead adsorption efficiency of capsules was improved from 267 to 316 mg
Pb+2/g dry alginate.
- The ability of the capsules to adsorb other heavy-metal cations—copper (Cu2+), cadmium (Cd2+) and nickel (Ni2+)—has been demonstrated.

Adsortion efficiency of different metal cations by capsules. Each result is the average of four different batches ±SD. Different superscripted letters indicate significant differences at P<0.05.

Development Milestones

- Alternative methods for employing the capsules are being tested
- Similar liquid-core capsules able to absorb anions such as phosphate, chromate, arsenate, sulphate, etc. are being developed.

The Opportunity

Cost-effective and environmentally friendly wastewater treatment

Patent Status

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