A method for recovery of metals and ionic material from water or other aqueous solutions using graphene oxide (GO) and simple pH changes. The system allows for recycling of the GO adsorbent, lower operating costs and potentially increased revenue from recovered materials.

THE CHALLENGE

Purification of aqueous streams is an important technology in many industrial, mining and biochemical settings. Recovery of by-products from the aqueous streams offers the possibility of increased revenue through reuse or sale of these materials.

Previous studies have shown that GO is a suitable material for purifying water containing many types of by-products or pollutants such as antibiotics or heavy metals.

Typical adsorption capacities of GO (ca. 100 mg/g for heavy metal ions) are approaching those seen for the zeolites commonly used.

GO offers the advantage of being readily and cheaply prepared from abundant natural graphite deposits. However certain limitations prevent widespread use of GO as a vehicle for separation:

- Conventional covalent GO composite materials production is complex, using high energies and multistep procedures that permanently change the structure and chemistry of the GO
- GO is difficult to remove from solution, as it forms a stable dispersion
- Heavy metals are bound to the GO composite material and cannot be easily recovered

Viable methods for recovering GO from solution need to be developed for its use in large-scale industry to be plausible. It is these key challenges that we address with this technology.

THE TECHNOLOGY

The experimental concept of our new technology is shown schematically in Figure 1 and demonstrated in Figure 2.

This technology offers the following:

1. Uses cheap and readily processed materials, which circumvents the need for difficult and lengthy syntheses of GO nanocomposites and offers low energy alternatives to centrifugation and polymer flocculation
2. Capture of GO via this route is fully reversible as the GO can be redispersed into solution by readjusting the system pH
3. The GO is unaltered by this process; there is no compromise to its original properties following adsorption, and therefore the GO and magnetic material can be reused
4. The heavy metals can potentially be recovered for further processing


THE OPPORTUNITY

We seek a commercial partner to license this technology.

Reference


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