Low Cost Nanocomposite Materials for Next Generation Water Filtration

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Not everyone has access to safe, clean drinking water, according to the WHO that number is 1 in 6. Water is contaminated from the influence of both natural and man made influences, for example Nepal has contamination from naturally weathered arsenic, whereas many places suffer from poor sanitation, agricultural and industrial waste.

A common material used for remediation is Iron, due to its high reactivity. It is also low cost, readily available and environmentally compatible.

Contaminant removal is a surface mediated process, hence by using nano iron to increase the surface area the efficiency of removal is increased.

Currently iron nanoparticle are injected into groundwater to remove contaminants, however, their ability to transport is limited by their tendency to aggregate. To overcome this problem the aim is to create a continuous immobile nano-composite by incorporating nano particles into a bulk structure.

The two bulk supports I'm currently focussing on are industrially made vitreous carbon foam, and a carbon commercial filter which is currently used in domestic situations.

One method I am researching is electrodeposition, this works well for the reticulated vitreous carbon (RVC), which is highly conductive. However, this material is expensive while the carbon filter is cheap but lowly conductive.

To overcome this problem I am also researching is jetspraying, which involves mixing the iron nanoparticles with butanone and semi thixatropic to create the right consistency. This has been successful , however, there is some improvement to be made here to increase porosity as the smaller nanoparticles condense together.

Further research includes inproving and developing coating methods and substrates, contaminant and iron dissolution tests, incorporating other remediating nanoparticles and investigating recyclability.

Fig.1 Children unable to access clean water supplies.

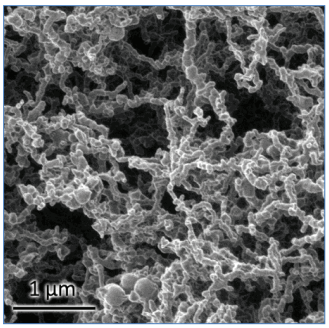

Fig. 2 A zero-valent nano iron structure.

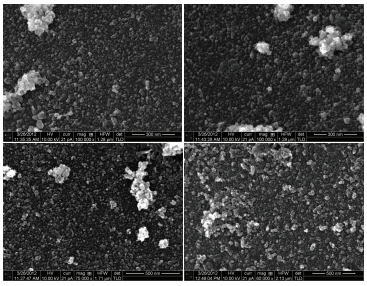

Fig. 3 SEM image of RVC foam with nano iron electrodeposition.

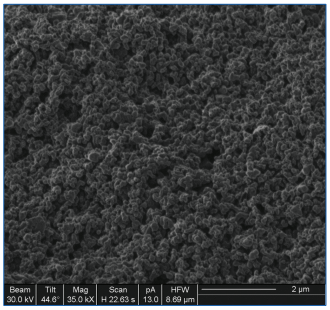

Fig. 4 Jetsprayed iron nanoparticles on a solid surface.