Adsorbent filter to remove arsenic from contaminated water sources

Summary

Arsenic contamination in drinking water sources is a public health problem that is not totally solved in the whole of the population areas and countries. The cost of the implementation and maintenance of an efficient system is huge that's why not all the towns and rural areas have one at the same level of efficiency as cities. At the present time, the arsenic metal amount accepted in water for the human intake has decreased to 10 ppb.
Currently, adsorption systems for arsenic removal using iron and aluminium hydroxide lack of efficiency.

We have developed an adsorbent filter based on Superparamagnetic Iron Oxide Nanoparticles (SPION) and polyacrylonitrile (PAN) nanofibers that has high efficiency for arsenic removal from contaminated water. We are seeking a company partner to further develop the technology through a co-development and license agreement.

Innovative aspects and applications

> New adsorbent filter has high efficiency for arsenic removal from domestic and community drinking water.

> New adsorbent filter removes 6 times more Arsenic as current adsorbent Systems.

> Swelling effect that improves the contact surface between the arsenic solution and the adsorbent material.

> Small solid waste that can be easily treated or stored

State of development

> Manufacturing procedure has been optimized. More than 95 % of the SPION is fixed over PAN nanofibers surface providing an optimal amount and distribution

> Efficiency studies of arsenic removal are done in synthetic samples and real arsenic contaminated water.

IP Rights

Priority patent application: 6th February 2013
PCT application. Filing date: 6th February 2014

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The Invention

Novel adsorbent filter formed by Superparamagnetic Iron Oxide Nanoparticles (SPION) on the surface of polymeric nanofibers of polyacrylonitrile (PAN) (See Figure 1). SPION have been proposed as an appropriate material to increase the arsenic adsorption from contaminated waters.
This new adsorbent system that includes PAN nanofibers overcomes the SPION aggregation and improves the adsorption. Arsenic removal is 30 times higher in comparison with SPION suspension and there is not SPION release to the liquid.

Experimental results are obtained in both batch and continuous mode showing that adsorption efficiency is improved by counter-flow in continuous mode. To date, studies in real Arsenic contaminated water show the same results and similar behaviour as synthetic samples (See Figure 2).

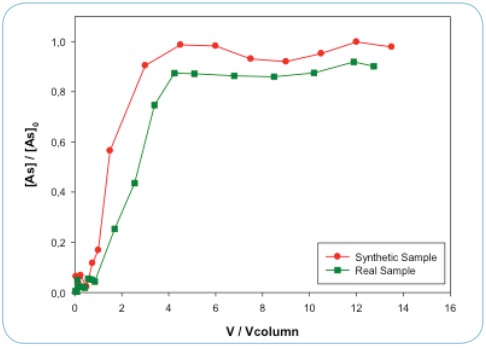

Fig. 2. Plot shows removal arsenic efficiency in a counter-flow system column for synthetic and real contaminated water samples.

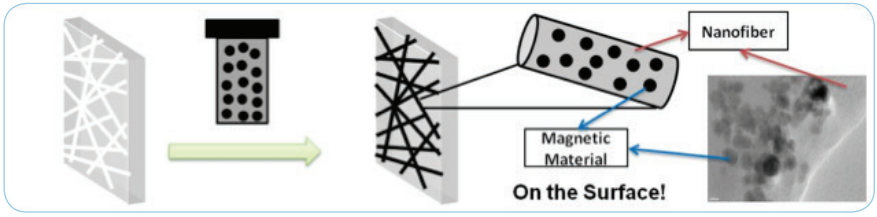

Fig. 1. Last step in the process of synthesizing the adsorbent consisting of PAN-SPION nanofiber. SPION is represented by black circles and PAN is represented by white strands. SPION is placed on the surface of PAN.

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