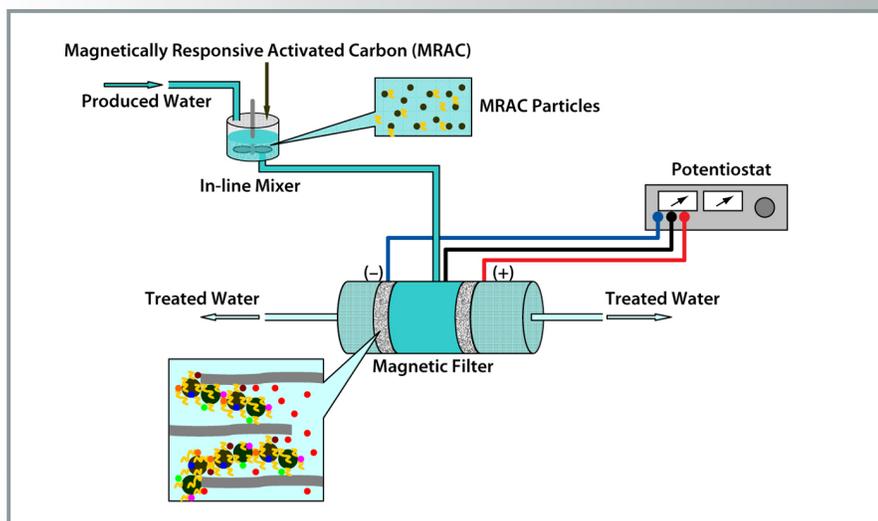


Magnetic Filtration Process, Magnetic Filtering Material, and Method of Forming Magnetic Filtering Material

UT-B IDs 200702013, 200702018



Technology Summary

ORNL researchers developed a new method for filtering materials and managing wastewater. This invention offers an integrated, intensified process to handle organic contaminants and heavy metals. By combining several separation processes and targeting different groups of contaminants, this invention is both cost effective and has the capability to be used in situ.

Produced water or wastewater from coal-methane facilities and other industries contains a complex mixture of contaminants, such as colloidal particles, molecular-weight organic contaminants, heavy metal ions, and soluble electrolytes. Currently available processes for industrial wastewater treatment have limitations that make them unattractive to coal-methane operations. Desalination, ion exchange, and osmosis techniques incur increased energy costs due to high temperature and high pressure operating conditions; these methods also result in detrimental effects on the treated water.

The invention combines sorption, electrosorption, magnetic seeding, and subsequent magnetic filtration to separate contaminants. Magnetically responsive activated carbon, plus a technique for forming this material, is central to the process. This method typically includes activated carbon in a solution with ions of ferrite forming elements; increasing the pH of the solution then produces particles of ferrite that bond to the activated carbon. In addition, the invention provides a means of filtering wastewater using magnetically activated carbon.

Advantages

- Lower energy consumption
- Reversible operation
- Minimal secondary waste
- Effective separation at low concentrations of target species
- Controlled adsorbent mobility

Potential Applications

- Produced water and wastewater treatment
- Filtration
- Clarification
- Decolorization
- Desedimentation
- Deflocculation
- Desalination

Patent

Patricia Taboada-Serrano, Constantino Tsouris, Cristian I. Contescu, and Joanna McFarlane, *Magnetic Filtration Process, Magnetic Filtering Material, and Method of Forming Magnetic Filtering Material*, U.S. Patent Application 12/338,442, filed December 18, 2008.

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