# MTAC Fact Sheet

## Arsenic and Bacteriophage MS2 Removal from Groundwater by Nanoparticulate Aluminum Oxide Coated Granular Filter Media: A Pilot-Scale Evaluation on the Effect of pH and Coating Density

Boris L. T. Lau, Gregory W. Harrington, Marc. A. Anderson
Department of Civil and Environmental Engineering
University of Wisconsin – Madison

Adsorptive filtration is a technique based on coating a filter medium with adsorbents, resulting in modified media that can act simultaneously as a filter and as an adsorbent. Adsorptive filtration is a promising technology for removal of inorganic anionic groundwater contaminants like arsenic and microbiological groundwater contaminants like viruses.

While previous studies have demonstrated the ability to coat granular media by precipitation of metallic salts, this study applied nanoscale aluminum materials as coatings. The performance of these coatings was tested by using arsenic as a representative dissolved anionic contaminant and bacteriophage MS2 as a representative virus. This study also evaluated the release of aluminum from the coated materials in an effort to assess the possible risks of the coated material. The effects of pH and coating density on contaminant removal were evaluated with coated and uncoated anthracite and with coated and uncoated granular activated carbon (GAC).

As expected, coating of anthracite with nanoscale aluminum oxide increased the surface area and increased the surface charge in the pH range typically encountered by water treatment systems. Coating of GAC also increased the surface charge, but led to a reduction in surface area, possibly due to blockage of GAC micropores.

Increased coating density resulted in higher arsenic and MS2 removal for both types of filter media. Not surprisingly, the increased coating density also led to an increase in aluminum released from the coating. Operating at pH 5.3 rather than pH 7.3 also led to higher removals of arsenic and MS2, as well as a greater release of aluminum from the surface. Additional studies are needed to assess the economic advantages and/or disadvantages of using nanoscale aluminum coatings for contaminant removal.