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Case ID:M17-105P^
Published: 2/26/2020

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Silver Salts and Impregnated Graphenes for Bromide Removal from Drinking Water

Silver Impregnated Graphene Oxide for Bromide Removal from Surface Water

SI Case #M17-105P

Background

Bromide is widely present in natural waters, as well as in drinking water. Due to a wide variety of factors, bromide levels are increasing in both surface and ground waters. Because bromide itself is not known to pose any direct human or ecosystem health effects, there are no current drinking or wastewater discharge regulations in place. However, when bromide in aqueous environments reacts with oxidants and disinfectants such as ozone or chlorine, it produces various carcinogenic by-products, which are regulated by the US Environmental Protection Agency as disinfection by-products (DBPs). Other DBPs may also form, which have high toxicity, and are currently unregulated. Many of these DBPs may be highly toxic, posing a significant threat to public health. Current technologies are not targeted for bromide removal and are not practical or economical ways of removing bromide from water. Therefore, there is a need for a more advanced removal process that is widely implementable for drinking and industrial water treatment processes, and selective for bromide.

Invention Description

Researchers at Arizona State University have developed a novel process for targeted bromide removal. The process involves use of high surface area, silver impregnated graphene oxide (GO-Ag), as an adsorbant to control and reduce brominated DBPs. Use of GO-Ag has been shown to produce similar efficiencies for bromide removal when compared to silver impregnated powder activated carbon (PAC-Ag) which is currently used in industry. Additionally, in complex water chemistries, GO-Ag has been shown to outperform PAC-Ag in terms of bromide removal. This research has also shown that silver salts react with bromide to form bromide precipitates, removing them from solution. The addition of silver salts and subsequent precipitation is a unique way to remove bromide from water in the presence of organics and other anions without posing any significant challenges to existing treatments.

Potential Applications

- Drinking water treatment
- Industrial waste water treatment
- Bromide removal for prevention of DBP formation
- Environmental sustainability

Benefits and Advantages

- Maximizes bromide removal while minimizing the overall risk and threat of DBP formation during the water disinfection/oxidation processes
- Easily implementable
- Targeted for bromide DBP removal
- Cost competitive to existing solutions
- Superior performance in natural organic matter environments

For more information about the inventor(s) and their research, please see:

Prof. Paul Westerhoff's Research Page