

ANOXKALDNES

Tracer™ Bromate

Removal of bromate with AnoxKaldnes™ Moving Bed Biofilm Reactors (MBBRs)

Industrial and municipal wastewaters can be loaded with special and complex compounds that are uncommon in biological wastewater treatment. These compounds, while difficult to remove, can also be potentially harmful to the environment and living organisms if left untreated. One of these compounds is bromate. One common source of bromate (BrO_3^-) is the oxidation of bromide (Br^-) in the presence of ozone, which is commonly used in wastewater treatment.

Biological treatment of bromate

Bromate can be biologically reduced to bromide. The reduction of bromate to bromide is influenced by the concentration of nitrate present, with the rate of bromate removal rapidly increasing once denitrification is complete. Bacteria obtain energy from the reduction of bromate into bromide and water in the absence of oxygen (nitrates and chlorates), and in the presence of a carbon and electron source. When neither oxygen nor nitrates are present, bromate can be used as the electron acceptor in the oxidation of the carbon source.

Why is bromate of concern?

Bromate in drinking water has been correlated to increased risk of cancer, and therefore a drinking water limit of $10 \mu\text{g/L}$ has been recommended by the World Health Organization (WHO). In addition, based on ecotoxicological impacts, a freshwater environmental quality standard of $50 \mu\text{g/L}$ has been suggested.

Since bromate is the result of the reaction of bromide with ozone, and with ozonation being a common wastewater treatment technology for disinfection and micropollutant removal, bromate is a compound gaining increased attention.



Water contaminated with bromide and bromate

Bromide, the precursor of bromate, can originate both from natural sources, namely seawater intrusion and sea-borne aerosols, and anthropogenic sources. Anthropogenic sources may include waste handling facilities, such as, landfills and waste incineration plants, biocides used in industrial water treatment, de-icing salt used on roads and the chemical industry. Bromate itself does not occur naturally in surface or groundwater, and until recently, was not a contaminant commonly detected in water bodies. The increasing implementation of advanced water treatment methodologies and disinfection processes, particularly ozonation or other advanced oxidation processes, has resulted in an increase in bromate levels in the natural environments.

Industrial applications for Tracer™ Bromate MBBRs



Air transport/
Airports



Municipal treatment plants
with bromides and ozonation
steps



Chemicals

Using AnoxKaldnes technologies to remove bromate

The technical feasibility of using Tracer™ Bromate MBBRs has been demonstrated for the treatment of bromide-contaminated effluents after an ozonation step. Tracer™ Bromate MBBRs have the potential to be incorporated as single process solutions or in staged biological treatment processes depending on the treatment requirements and contaminants present. Tracer™ Bromate can be used in combination with AnoxKaldnes eXeno™ technology, which can complement ozone treatment and decrease the original formation of bromates.

Feel free to contact us for more information about how AnoxKaldnes Tracer™ technology creates new possibilities in biologically removing harmful compounds in industrial wastewater.

AnoxKaldnes • Veolia Water Technologies
Klosterängsvägen 11A • 226 47 Lund • Sweden
Office: +46 (0)46 18 21 50
www.anoxkaldnes.com

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by **VEOLIA**
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