



## Comparison of the bromate ions removal by nanofiltration membranes under different operating conditions

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### ABSTRACT

Bromate is toxic compound which represent the carcinogenic effect for human health, a serial research's has been developed by the scientists for the efficient bromate removal methods from the water with low cost in order to obtain water to Bromate a maximum concentration level (10ppb). Bromate ions are formed as a result of the reaction between bromide ions and ozone used as a water disinfectant in membrane demineralization plants .Different technologies have been used for Bromate elimination from water such as ion exchange, adsorption, biofiltration, electrolysis and membrane technology. The aim of this work is to study the rejection of bromate ions by nanofiltration membranes (N30F from Nadir and DL from Osmonics) made from different polymers using bromate solution at different conditions (feed bromate concentration, transmembrane pressure, pH and ionic strength). The bromate rejection is related to the feed solution, pH and ionic strength and the nature of the membrane. At pH=8, bromate ions were removed by the DL membrane made from polyamide around with higher than those by the N30F made from polyethersulfone .

### 1. Introduction

The presence of bromate in drinking water is considered as a potential carcinogen for humans. Several research has been tested for the development of effective methods with low cost in order to reduce the concentration of bromate ions below acceptable standards of the World Health Organization (WHO). (10 ug/l)[1],[2],[3]. Bromate ( $\text{BrO}_3^-$ ) is formed after the ozonation of ground and source water and results from oxidation of bromide ( $\text{Br}^-$ ), which naturally exists in ground water[4],[5]. It is also a contaminant in hypochlorite solutions produced by electrolysis of salts and seawater containing bromide [6], Following the ozonation process, it has been proved that the Bromate ions concentration formed can exceed 50  $\mu\text{g/L}$  for a bromide ions concentration greater than 100  $\mu\text{g/L}$ . Different methods can be used for promoting removal Using various technologies including filtration, photocatalysis , arc discharge, chemical reduction, activated carbon techniques, and biological remediation[7]. Membrane processes can be considered

a promising technology for removing Bromate from water. The application of membrane technology in the depollution of water with a relatively low energy cost, no requirement of chemical substances to be added. Reverse osmosis (RO) can remove  $\text{BrO}_3^-$  [8], [9], but it is an expensive process, as membrane fluxes are low and high operating pressures are needed.. The variation of the membrane surface charge is mainly due to anion adsorption of water rather than to fixed charged groups, the Bromate removal from water by nanofiltration membranes. Most research has shown that the surface properties of nanofiltration membranes affect the separation of solutes and this following strict exclusion effect of pore size, but also the phenomena of repulsion and attraction of the charges found on the surface(Donnan exclusion phenomenon) [10]. It has been reported that the nanofiltration membranes with a molecular weight cut off of 150 to 300 a reject up to 50% of ions from low-turbidity water source and it was found also that  $\text{BrO}_3^-$  can be effectively rejected in the range between 90% to 95% by nanofiltration membranes due to the charge repulsion