Biofilms formation in nanofiltration membranes

F. P. F., França[1], R. O. R., Calixto[1], V. C., Bezerra[1], P. M., Rocha[1], E. T. R., Bastos[2], C. C. R., Barbosa[2]
e-mail:fpfrança@eq.ufrj.br, ednaruas@ien.gov.br

[1] *UFRJ, EQ;* [2] *SEMAT, IEN*

Keywords: nanofiltration membrane, biofouling, biocide, sulfate reducing bacteria, seawater.

The membrane separation processes are becoming an increasingly important purification alternative for products and water treatment in general. One of these processes is nanofiltration (NF), an intermediate process between reverse osmosis and ultrafiltration [1]. A major challenge of these processes is the accumulation of the material on the membrane surface or within the pores, this phenomenon is commonly known as fouling. This is a limiting phenomenon for the operation membrane, reducing the permeate flux, increasing operating costs and shortening the life of membranes. This work studies the formation of biofilm on the surface of NF membranes (DK,Osmonics/GE) and membranes synthesized in our laboratory containing DDS(bis-4-aminophenyl-sulfone) in this composition, DBNPA(2,2-dibromo-3-nitrilopropionamide) as a biocide agent added to the seawater coming from Galeão,RJ. Experiments to evaluate membranes were performed in permeation system with filtration cell with tangential displacement of 15 bar for 8 days of operation. During the procedure, samples of water permeated through the membrane (permeate) to calculate rejection of sulfate ions. These analyses were performed at the Ion Chromatograph Dionex ICS 1000. For the process using seawater plus the biocidal substance (DBNPA) and antifouling, concentrations (PC-191T) of 300 ppm and 5 ppm, respectively were used and the contact time was 3h. The incubation was kept at 37 ± 1 ° C for 48 hours to 15 days for anaerobic and 15 days for BRS (sulfate reducing bacteria) total aerobic bacteria. The morphology of the membranes used in these experiments to check the formation of biofilm on the surface was characterized by SEM (Scanning Electron Microscopy). The presence of biofouling on NF causes adverse effects in separation processes: decline of permeate flux, an increase in operating pressure (to maintain the same flow) and degradation of the membrane. Most of the industries that use NF for water treatment ,uses polyamide membranes, however, with the continued use of these membranes, organic material deposition occurs as well as growth of microbial communities (biofouling) on the surface, causing decrease of permeate flux and selectivity of membranes. In accordance with the data of figure1 values of the sulfate ion rejection membrane for commercial (a) vary slightly with the addition product, which is not observed in the synthesized membrane(b), where the variation is increased [2].

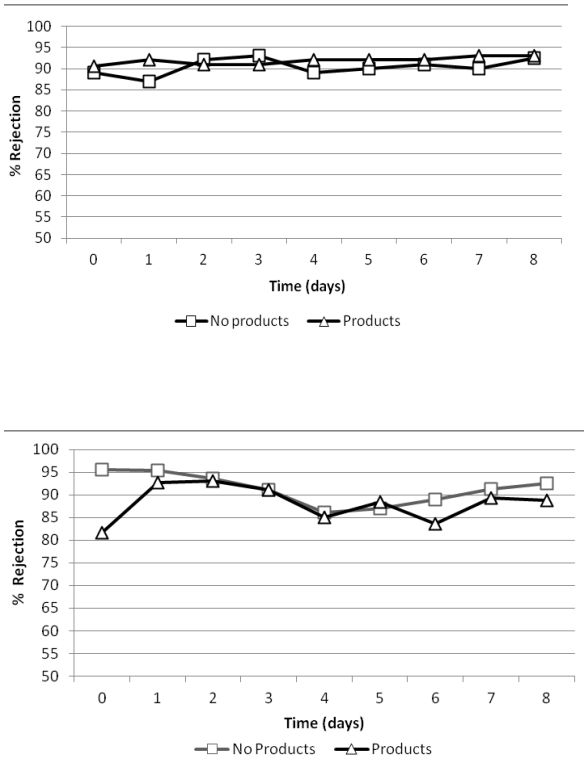

Figure1. % of sulphates íons rejection during the performance process (a, b).

References

[1] MULDER, M. **Basic principles of membrane technology**, Dordrecht: Kluwer Academic, 1991. 363 p.
[2] BANNOUD, A. H. Elimination of hardness and sulphate from water by Nanofiltration. **Desalination**, Amsterdam, v. 137, n. 1/3, p. 133-139, mai. 2001.