Retention Measurements of Nanofiltration Membranes for Bio-treated Wastewaters

Samuel Bunani\textsuperscript{a}, Eren Yörükoğlu\textsuperscript{a}, Gökhan Sert\textsuperscript{b}, Ümran Yüksel\textsuperscript{a}, Nalan Kabay\textsuperscript{c}, Mithat Yüksel\textsuperscript{c}, Özdemir Egemen\textsuperscript{b}

\textsuperscript{a}Ege Üniversitesi, Fen Fakültesi, Kimya Bölümü, İzmir
\textsuperscript{b}Ege Üniversitesi, Su Ürünleri Fakültesi, İzmir
\textsuperscript{c}Ege Üniversitesi, Mühendislik Fakültesi, Kimya Mühendisliği Bölümü, İzmir

\texttt{bunanisamuel@hotmail.fr}

\textbf{Özet:} In the present work, the retention performances of various nanofiltration (NF) membranes were studied for bio-treated wastewater samples. In this context, three different NF membranes (CK, GE-Osmonics; NF-270 and NF-90, Dow-FilmTech) were tested using a cross-flow flat-sheet membrane test unit (SEPA CF-II, GE). Samples were obtained from Çiğli Municipality Wastewater Treatment Plant and from ITOB-OSB Wastewater Treatment Plant. All three NF membranes are negatively charged at neutral pH. The membranes NF-270 and NF-90 are hydrophilic polyamide membranes while CK membrane is a hydrophobic cellulose acetate membrane. The MWCO of these membranes are in the following order: NF-270>NF-90>CK. The order of water permeabilities of these membranes followed the same trend. The membrane CK was expected to be the best in terms of its retention performance for COD, color, TOC, salinity, conductivity, cations and anions based on its MWCO but the retention order was found to be as NF-90>CK>NF-270. The discrepancy observed in the retentions properties of the NF membranes is due to the difference in some of their physical and chemical properties such as pore size defined as molecular weight cut-off (MWCO), surface characteristics, material in which the membranes are made and so forth. The NF-90 was concluded to be the best among the NF tested membranes. In treatment of Çiğli municipal wastewater, NF-90 performed average retentions of 86.7\%, 91.7\%, 86.0\%, 90.3\% and 89.0\% for COD, color, TOC, salinity and conductivity, respectively. During treatment of ITOB-OSB wastewater effluent, the respective retention values of NF-90 were 89.2\%, 95.0\%, 95.0\%, 92.3\% and 91.6\%.

\textbf{Keywords:} Bio-treated wastewater, membrane bioreactor (MBR), nanofiltration, water reuse

\textbf{Acknowledgement:} This study was supported by Ege University (Project Numbers: EU-2011-FEN-089 and EU-2012 MUH 035).