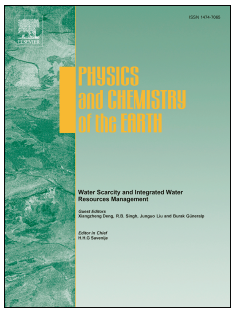
Accepted Manuscript



Effect of incorporating graphene oxide and surface imprinting on polysulfone membranes on flux, hydrophilicity and rejection of salt and polycyclic aromatic hydrocarbons from water

Rose Waithiegeni Kibechu, Derek Dinteh, Titus Alfred Makudali Msagati, Bhekie Briliance Mamba

PII: S1474-7065(16)30040-7

DOI: 10.1016/j.pce.2017.01.021

Reference: JPCE 2566

To appear in: *Physics and Chemistry of the Earth*

Received Date: 8 May 2016

Revised Date: 26 October 2016

Accepted Date: 31 January 2017

Please cite this article as: Kibechu, R.W., Dinteh, D., Msagati, T.A.M., Mamba, B.B., Effect of incorporating graphene oxide and surface imprinting on polysulfone membranes on flux, hydrophilicity and rejection of salt and polycyclic aromatic hydrocarbons from water, *Physics and Chemistry of the Earth* (2017), doi: 10.1016/j.pce.2017.01.021.

Effect of incorporating graphene oxide and surface imprinting on polysulfone membranes on flux, hydrophilicity and rejection of salt and polycyclic aromatic hydrocarbons from water

[a]Rose Waithiegeni Kibechu, Derek Dinteh[b]Titus Alfred Makudali Msagati, [b]Bhekie Briliance Mamba

a. Department of Applied Chemistry, University of Johannesburg, P.O BOX 17011 Doornfontein, 2028 Johannesburg, South Africa

b. University of South Africa, College of Science Engineering and Technology, P.O. BOX P/B X6, Roodepoort, South Africa. Titus Alfred Msagati:msagatam@unisa.ac.za

We report a significant enhancement of hydrophillity of polysulfone (Psf) membranes after modification with graphene oxide (GO) as a filler followed by surface imprinting on the surface of GO/Psf composite imprinted membranes (CIMs). The surface imprinting on the GO-Psf membrane was employed in order to enhance its selectivity towards polycyclic aromatic hydrocarbons (PAHs) in water. The CIMs were prepared through a process of phase inversion of a mixture of graphene oxide and polysulfone (Psf) in N-methylpyrrolidone (NMP). Fourier-transform spectroscopy (FT-IR) of the imprinted showed new peaks at 935 cm^{-1} and 1638 cm^{-1} indicating success in surface imprinting on the GO-Psf membrane. The CIM also showed improvement in flux from 8.56 $LM^{-2}h^{-1}$ of unmodified polysulfone membrane to 15.3 $LM^{-2}h^{-1}$ in the CIM, salt rejection increased from 57.2±4.2 % of polysulfone membrane to 76±4.5 %. The results obtained from the contact angle measurements showed a decrease with increase in GO content from 72±2.7 % of neat polysulfone membrane to 62.3±2.1 % of CIM indicating an improvement in surface hydrophilicity. The results from this study shows that, it is possible to improve the hydrophilicity of the membranes without affecting the performance of the membranes.

Key words: Membrane hydrophilicity, fouling, Graphene oxide, surface imprinting, polycyclic aromatic hydrocarbons

1. INTRODUCTION

Polycyclic aromatic hydrocarbons (PAHs) incorporate a broad class of chemicals characterized by the presence of three or more benzene rings fused together in a way that each pair of fused rings share two carbons (Grellier *et al.,* 2015). PAHs occur naturally or may be formed through anthropogenic activities such as the incomplete combustion of fuels which results to their continuous accumulation and input in the environment. They are found suspended as particulate