



Partial nitrification in a membrane-aerated biofilm reactor with composite PEBA/PVDF hollow fibers

Grace M. Nisola^a, Jennica Orata-Flor^a, Sehee Oh^a, Namjong Yoo^b, Wook-Jin Chung^{a,*}

^aDepartment of Energy Science and Technology (DEST), Energy and Environment Fusion Technology Center (E2FTC), Myongji University Science Campus, San 38-2 Namdong Cheongu, Yongin 449-728, South Korea
Tel. +82 31 330 6687; Fax: +82 31 337 2902; email: wjc0828@gmail.com

^bIlshin Environmental Engineering Co. Ltd., Seoul, South Korea

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ABSTRACT

Ammonia removal via nitrite was performed in membrane-aerated biofilm reactors (MABR). Two types of hollow fiber (HF) modules, uncoated microporous polyvinylidene fluoride (PVDF) and composite polyether-block-polyamide copolymer (PEBA) coated PVDF, were used as supports for the growth of ammonia oxidizing microorganism biofilm system. For the composite HF, a suitable coating material was selected between hydrophilic and hydrophobic types of PEBA. Results reveal that hydrophobic PEBA 2533 was more suitable for bacterial adhesion. The formation of coating layer was successfully confirmed through field emission scanning electron microscope. Other surface characterizations were performed through atomic force microscopy and contact angle measurements. Partial nitrification experiments at varied feed concentrations and hydraulic retention times reveal that MABR with uncoated PVDF HF exhibited slightly higher ammonia removal than the MABR with composite HF. In terms of nitrified products, MABR with composite HF produced >90% of the removed ammonia in nitrite form. On the other hand, around 50% of nitrite was converted to nitrate in the MABR with uncoated PVDF. Thus, between the two membranes tested, PEBA 2533 coated PVDF is the more suitable HF for ammonia removal via nitrite formation in the MABR system.

Keywords: Ammonia; MABR; Nitrite; Partial nitrification; Polyether-block-polyamide; PVDF

*Corresponding author.

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