MUNICIPAL WASTEWATER FILTRATION BY DYNAMIC MEMBRANE: FILTER MEDIA CHARACTERIZATION AND PERFORMANCE ASSESSMENT

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Introduction. The anaerobic membrane bioreactors (AnMBR) are a cost-effective system which successfully incorporated membrane technology for better water quality, but its development has been hampered mainly to the high cost of membrane modules and biofouling which is very severe [1]. Dynamic membrane (DM) is a promising technology that can solve the drawbacks of the AnMBR. These are formed on the surface of a coarse porous support, especifically the biofouling layer formed has the capability of rejection of pollutants, not the support [2]. To date there are few studies of DM in aerobic systems, in anaerobic the research is still limited, however all the research have focused on pollutant removal effects [3] but the material selection and DM process formation are not well standardized. The purpose of this study was to find the operating parameters in which a DM is formed with different porous supports and evaluate the filtration performance.

Methods. A pilot UASB bioreactor was used to treat municipal wastewater. Flat-sheet modules made of different media support (it have been characterized the mechanical properties as breaking strength (BS) ASTM D5034-09 and tearing strength (TS) D2261-96),table 1) were mounted sidestream to the UASB, the permeate was discharged by gravity using 2 m of water head drop and it was monitored the instantaneous flux and the following parameters: total chemical oxygen demand (COD), suspended solids (SS), and turbidity. The biofouling layer deposited in different supports was observed by SEM.

Results. Several filtration experiments were conducted to select the best filter media in terms of flux and permeate quality, which turned out to be polyester cloth.

Table 1. Characterization of filter media

Filter media	BS (MPa)	TS (MPa)	Thickness (mm)
Polyester cloth	75.22	7.87	0.35
Polypropylene cloth	89.94	18.97	0.75
Stainless steel mesh	12.81	0.048	0.03

The DM was operated for one day. As the flux was declining (stabilized around 10 L/m^2h) the cloth support began to form a fouling layer on its surface and the quality of the permeate was improving (figure 1).

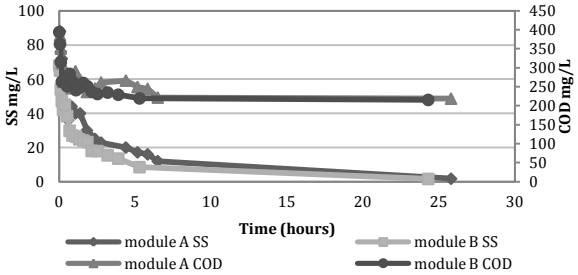

Fig. 1. COD and SS concentration variations during experiment.

The SEM photographs of DM surfaces are shown in Fig. 2. As can be seen from figure 2 (a), the surface of unused polyester cloth is wrinkled. Figure 2(b), (c) and (d) showed a complete fouled membrane which is mainly form by microorganisms.

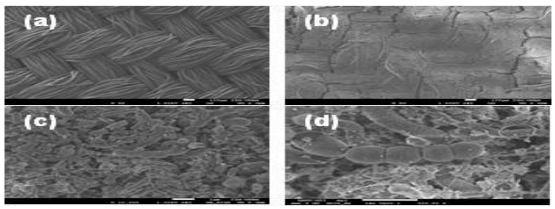

Fig.2. SEM photographs of: (a) clean membrane surface, (b),(c) and (d) fouled membrane.

Conclusions. In order to understand the role of the microorganisms in the filtration performance, it is necessary to characterize the attached microbial communities and the fouling layer substances like EPS and PMS. The DM was well formed in an anaerobic bioreactor and could act as an alternative to commercial membranes particularly in rural areas where are required low costs of acquisition, operation and maintenance.

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References.

1. Liao B.(2006).*Crit. Rev Environ. Sci. Technol.* Vol.(36):489-530.
2. Zhang X, Wang Z, Wu Z, Wei T, Lu F, Tong J, Mai S.(2011).*Process Biochem*. Vol.(46):1538-1544.
3. Zhang X, Wang Z, Wu Z, Lu F, Tong J, Zang L.(2010).*Chem Eng J*. Vol.(165):175-183.