포스터 발표 P-4

막오염 저항성이 우수한 나노여과 및 역삼투막의 염색폐수 적용

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USE OF FOULING RESISTANT NANOFILTRATION AND REVERSE OSMOSIS MEMBRANES FOR DYEING WASTEWATER EFFLUENT TREATMENT

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1. Introduction

The dyeing effluent is a highly colored stream containing unfixed dyes along with salts and auxiliary chemicals such as emulsifying agents. Moreover, Textile dying is a chemically intensive process and consumes large quantities of water. Difficulties in the effluent treatment arise from its non-degradable property by aerobic digestion. The stringent environmental regulations for discharge today are forcing the dyers and finishers in the textile industry to

examine the potential for recycling the water from the waste stream by newer technologies.

Membrane filtration processes offer effective alternatives to effluent treatment. The membrane separation process can recover reusable water from the permeate stream, thus reducing water consumption and minimizing effluent discharge [1-2]. In recent years, the fouling of NF and RO membranes has been widely investigated [3-4]. However, TFC membranes, especially RO membranes are sensitive to fouling because of their rough surface morphology and highly negative surface charge.

In this work, an experimental investigation of membrane filtration of the dyeing wastewater is reported. We have presented a hybrid system consisting of pre-treatment (coagulation, activated sludge process, MF and UF) followed by NF or RO to treat and reuse dyeing wastewater. We also investigated the effect of surface morphology and charge of membrane on fouling.

2. Experimental

The MF, NF, and RO membranes were used to treat the dyeing wastewater. The MF membrane is a flat-sheet type and prepared by the phase inversion method. The membrane unit had an effective surface area of 35.36 cm2. The NF and RO membranes were supplied from Sae-Han Corporation and designated as CSM-NE and CSM-RO. The NF and RO membranes were coated with polyvinyl alcohol (PVA) to decrease surface charge and surface roughness. The test unit consisted of rectangular membrane cells, a back-pressure regulator, and a high pressure pump (Hydracell pump, Model-13, Wanner Engineering, USA). The active area of the membranes was 37.35 cm^2. To investigate the fouling on the NF or the RO membrane, The membrane cell was a thin-channel rectangular type, providing a cross-flow over the membrane surface. The experiments were conducted at a constant initial water flux of 1.0 m^3/m^2day. The wastewater was fed into the membrane cell. The flux was normalized by dividing flux with time (J) by

initial water flux of steady state (J_0). The temperature and the flow rate in the experiment were 25℃ and 3.0 *l*/min, respectively.

3. Conclusions

Dyeing wastewater (influent, coagulated water and effluent) was treated through MF, NF and RO membranes. The NF and RO membranes were coated with a neutral PVA polymer. The PVA-coated membranes showed a lower surface charge and roughness. The PVA-coated NF and RO membranes reduced fouling significantly. Effluent was feasible for membrane filtration compared with influent and coagulated wastewater owing to the lower loading of SS and COD. In order to use membrane process successfully, the effluent should be remove SS completely by using MF membrane. The PVA-coated NF or RO membranes after MF of the effluent was useful for the reuse of the dyeing wastewater in terms of water quality and the problems in membrane fouling.

References

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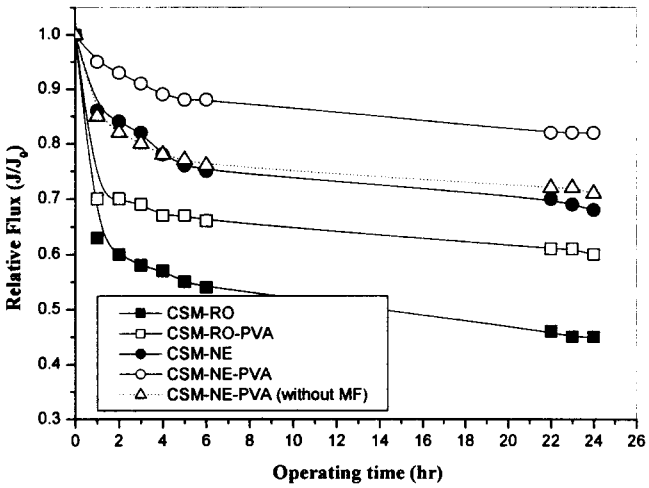

Figure NF and RO of coagulated wastewater after MF or without MF.