

## Examination of Fouling Mechanism on Ion-Exchange Membranes and Development of Ion-Exchange Membranes with High Anti-Fouling Properties (II)

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### Summary

Fouling of an ion-exchange membrane is one of the most serious problems in their application to many industrial fields such as water treatment, food industry, medical supplies and waste water treatment. In case that electrodialysis (ED) consisting of an ion-exchange membrane and aqueous solutions of salts containing organic substances, particularly macromolecules, organic fouling of the membrane occurs and deteriorates a performance of the membrane.

In this study, novel aliphatic-hydrocarbon-based anion-exchange membranes (AEMs) were prepared from glycidyl methacrylate (GMA)/divinylbenzene (DVB). Their ion-transport and anti-organic fouling properties were compared with those of aromatic-hydrocarbon-based AEMs prepared from chloromethylstyrene (CMS)/DVB copolymers and also with commercially-available AEMs, Neosepta ASM. We have measured the time-voltage curves in an ED system consisting of an sample AEM, Neosepta CMX and NaCl aqueous solutions containing sodium dodecylbenzene sulfonate (DBS) as an aromatic foulant, changing DBS concentration and the value of the constant current during ED period.

The slopes of the voltage difference between the electrodes of the ED system with all the AEMs at 500 ppm of DBS are higher than those at 200 ppm. The higher current density the system has, the steeper slope the time-voltage curves have in all the AEMs. The slope of the voltage-time curve of the aliphatic AEM, GMA-AEMs is gentler than that of the aromatic one, CMS-AEM and AMX. The slope increases when organic fouling occurs during ED period. This implies that the DBS affinity factors for the aliphatic AEMs are much lower than those for the aromatic AEMs and the commercially available ones. The aliphatic AEMs have lower numbers of benzene rings than the aromatic AEMs and the commercially available AEMs; this indicates that aromatic interactions (or  $\pi$ - $\pi$  interactions) are an important factor in organic fouling between aromatic foulants and AEMs with an aromatic matrix.