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Professor In S. Kim's research team produces specialized nano-filtration membrane for dye wastewater treatment

☐ GIST (Gwangju Institute of Science and Technology, President Kiseon Kim) School of Earth Sciences and Environmental Engineering Professor In S. Kim's research team developed a specialized loose nano-filtration membrane for dye wastewater treatment by adjusting the thickness of the active layer* of the membrane according to the electrospray time.

> * active layer: A dense layer of an asymmetric membrane that is responsible for the separation function of the membrane.

☐ The issue of unauthorized discharge of dye wastewater from the industrial complex during the rainy season is emerging as a social problem because of the burden of water purification costs, which can cost tens of millions of won. It is feared that industrial waste water that has not undergone a water purification process will have an adverse effect on water quality as its biochemical oxygen demand (BOD) and chemical oxygen demand (COD) are not only higher than the standard but also more likely to contain heavy metals. Accordingly, interest in methods for minimizing wastewater treatment costs is growing, and research on manufacturing a separator that can treat dye wastewater using less energy has been actively conducted. Current nano-filtration membranes have disadvantages in not being able to recycle inorganic salts because they remove dyes and inorganic salts at the same time, and they also increase the osmotic pressure, which eventually increases the consumption of operating energy.

- The research team used electrospray* interfacial polymerization** to control the thickness of the active layer in nanometers (1 billionth of a meter) to manufacture a thin, adjustable active layer. The water permeability of the water treatment separation membrane prepared under optimum conditions was 20.2 LMH/bar***, which exhibited ultra-high permeability while removing more than 99% of with 93% permeability for inorganic salts.

  * electrospray: A technology in which the solution is discharged from the microscopic nozzle by applying a high voltage to the solution to create a nanoscale size.

  ** interfacial polymerization method: A condensation reaction occurs between two unmixed interfaces to form an active layer.

  *** LMH/bar: A unit representing the permeation amount per unit area of the membrane per unit time at the operating pressure ($Lm^{-2}h^{-1}bar^{-1}$)

☐ The pollution prevention performance of a separator is determined by hydrophilicity*, surface roughness, and zeta potential**. The water treatment separation membrane manufactured by the electrospray interfacial polymerization method has improved hydrophilicity more than the conventional commercial separation membrane. The smooth surface and low zeta potential prevented the foulant from easily adhering to the surface of the membrane, resulting in an improvement in the water permeability recovery rate, which is an index of pollution prevention performance, by more than 30%.

  * hydrophilicity: The degree to which water molecules are easily bonded.

  ** zeta potential: A unit for the size of the repulsive force or attraction between particles.

☐ Professor In S. Kim said, "This research developed a separator that can reduce dye wastewater treatment costs by reliably removing dyes and recovering high-concentration inorganic salts. In the future, it is expected to be widely applied in the water treatment market, such as wastewater treatment and oil-water separation processes in the electronics industry."

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