Supporting Information

Figure S-1a. The illustrative drawing of the NF cell used in this study.

Figure S-1b. Pore size distribution curve of 50%H₂/N₂-CnM-1h.
Figure S-1c. The permeation flux - filtration time and rejection-filtration time profiles of the surrogate MB solution (10 ppmw) at 24 bar through the supported 50%H₂/N₂-CnM.
Figure S-2 Raman spectra of 5%H₂/N₂-CnM-1h and 50%H₂/N₂-CnM-1h
Figure S-3 Raman spectra of Ar-CnM-(Ni) with $I_D/I_G = 0.7$ and 50%H$_2$/N$_2$-CnM-(Ni) with $I_D/I_G = 0.74$. 
Figure S-4. Comparison of infrared spectra of 50%H$_2$/N$_2$-CnM-(Ni) with Ar-CnM-(Ni)

Water

![Graph showing water flux over time](image-url)

- Ar-CnM-(Ni)
- 50%H$_2$/N$_2$-CnM-(Ni)
Figure S-5. Comparison of hydrophilicity of nanopore channels in the two selected CnMs, Ar-CnM-(Ni) and 50%H$_2$/N$_2$-CnM-(Ni).