



# Poly(vinyl chloride) based Amphiphilic Copolymer Membrane: from Molecule Designing to Microstructural Tailoring

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**Abstract:** Clean water and reliable energy are two inexorably intertwined, pressing global challenges, in which membrane-based separation processes have been actively explored to solve it. The Poly(vinyl chloride) based amphiphilic copolymer with the varying ratio of hydrophilic and hydrophilic chain, controlled sequence structure of hydrophilic chain and wide range of charged function can be prepared on large-scale by emulsion polymerization or controlled interfacial polymerization reaction. Moreover, a series of microstructural tailoring methods with surface coating, direct immersion annealing, post crosslinking reaction and microphase separation providing the convenient access to the pore size regulation in the nanofiltration membrane fabrication.

## Introduction

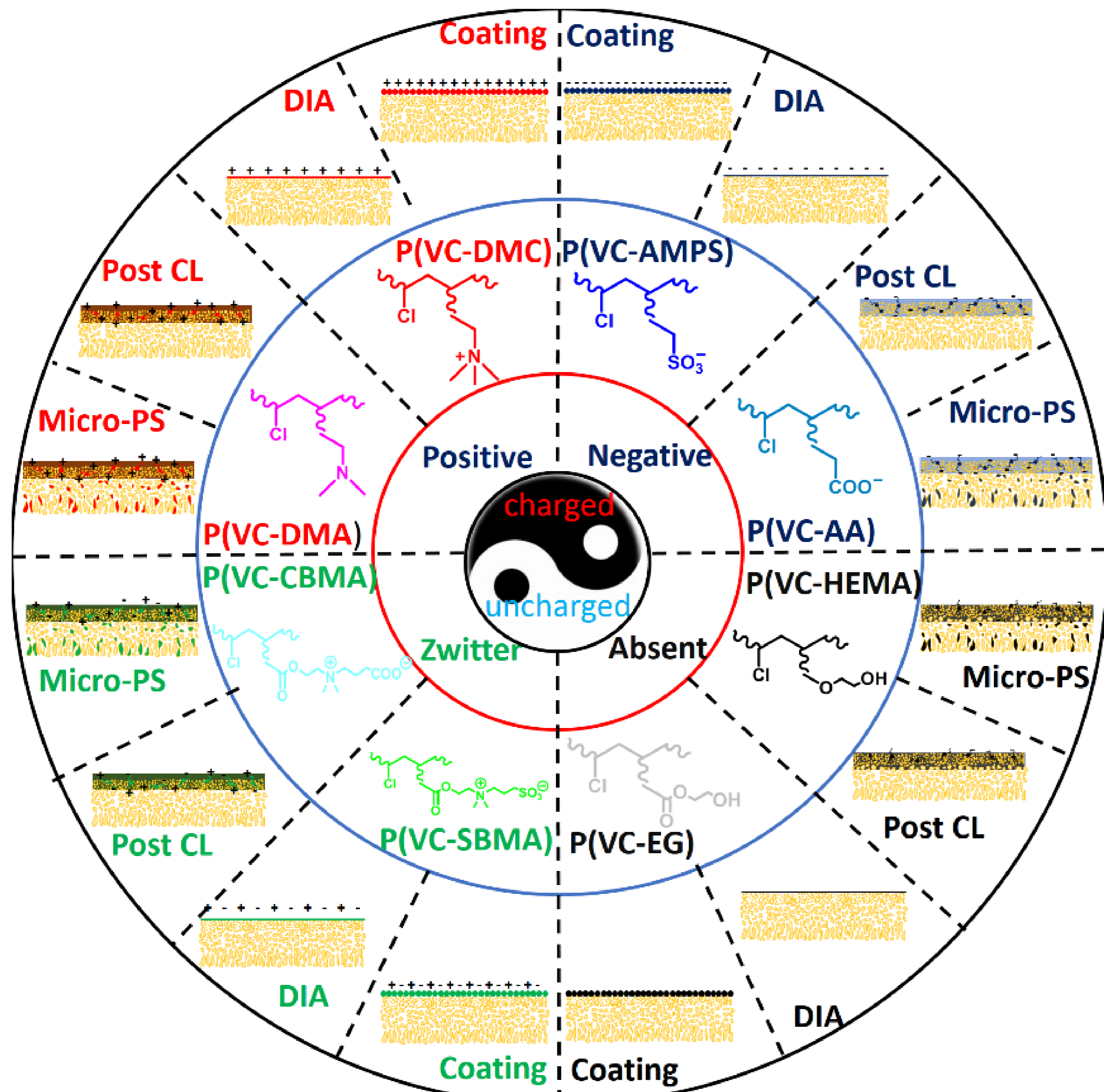


Fig. 1. the different type of PVC-based nanofiltration membrane: from molecular designing to microstructural tailoring

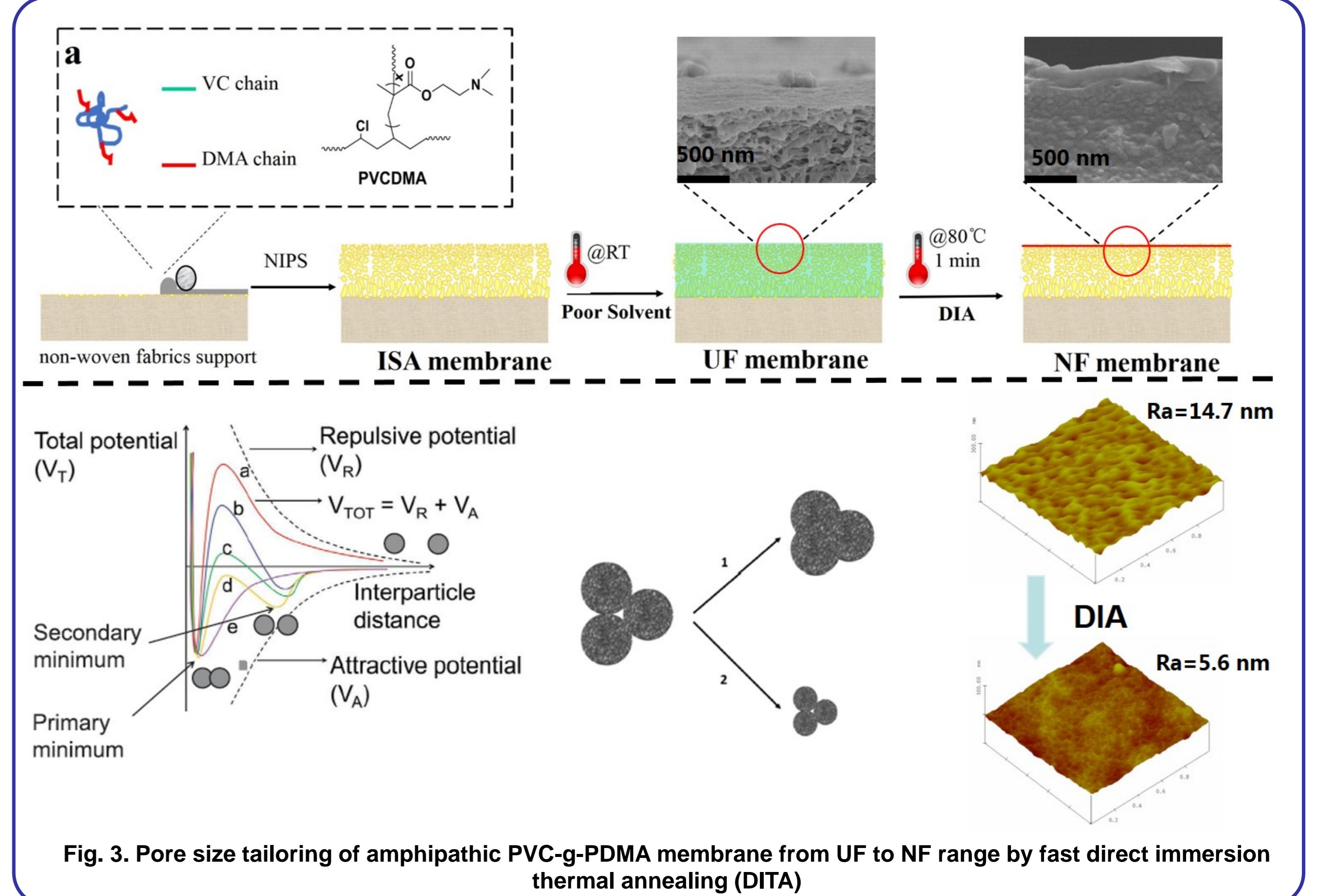


Fig. 3. Pore size tailoring of amphiphilic PVC-g-PDMA membrane from UF to NF range by fast direct immersion thermal annealing (DITA)

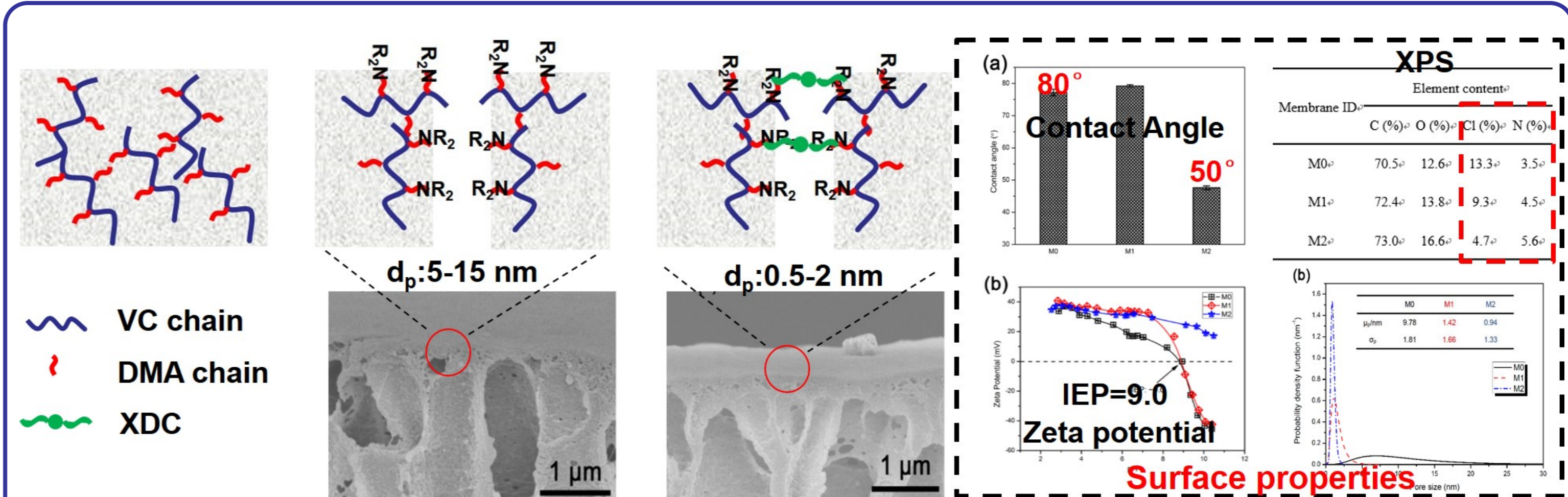


Fig. 4. High performance polyvinyl chloride-based nanofiltration membrane with positive charge

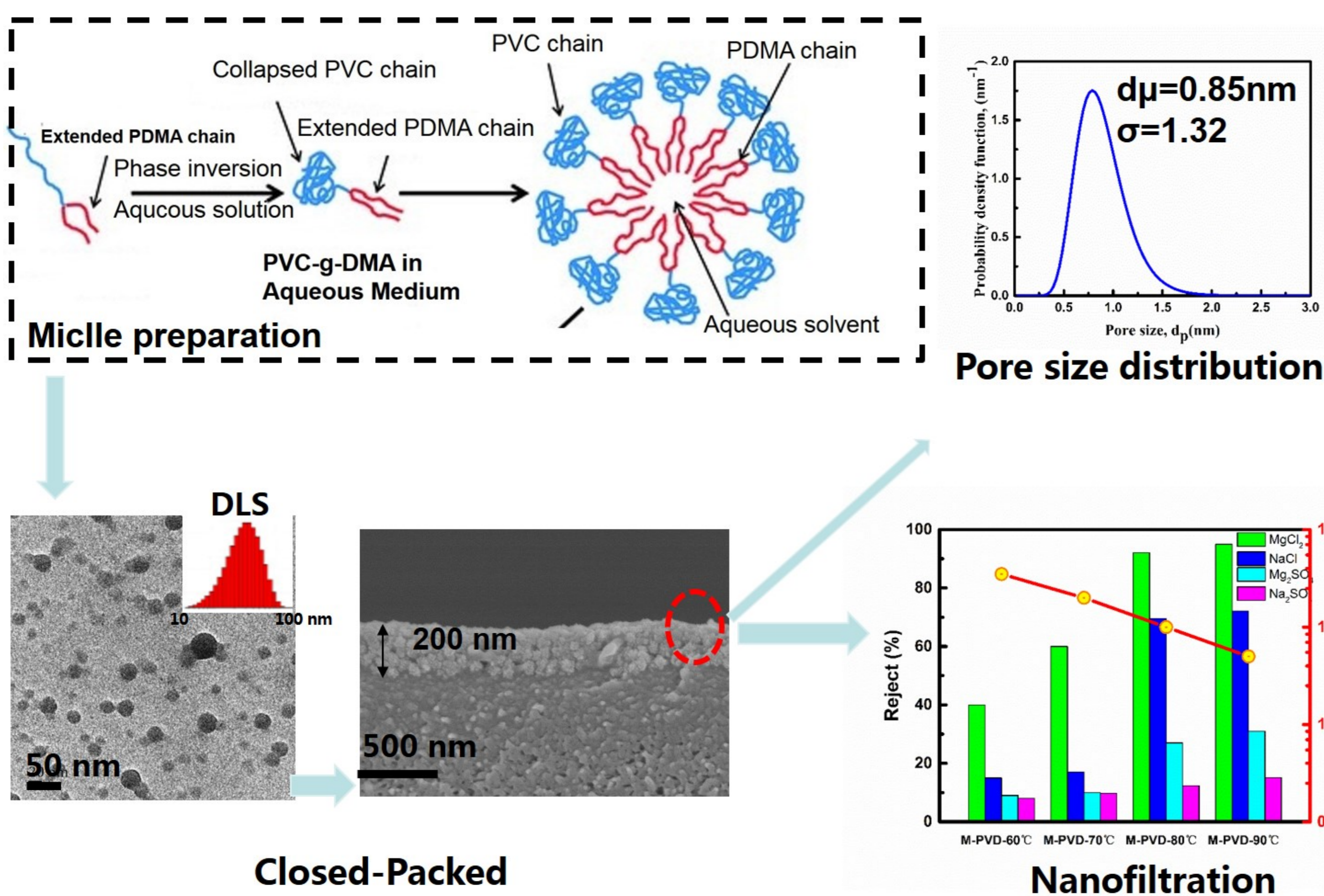


Fig.2 PVC/DMA nanofiltration membrane prepared by micelle closed-packed

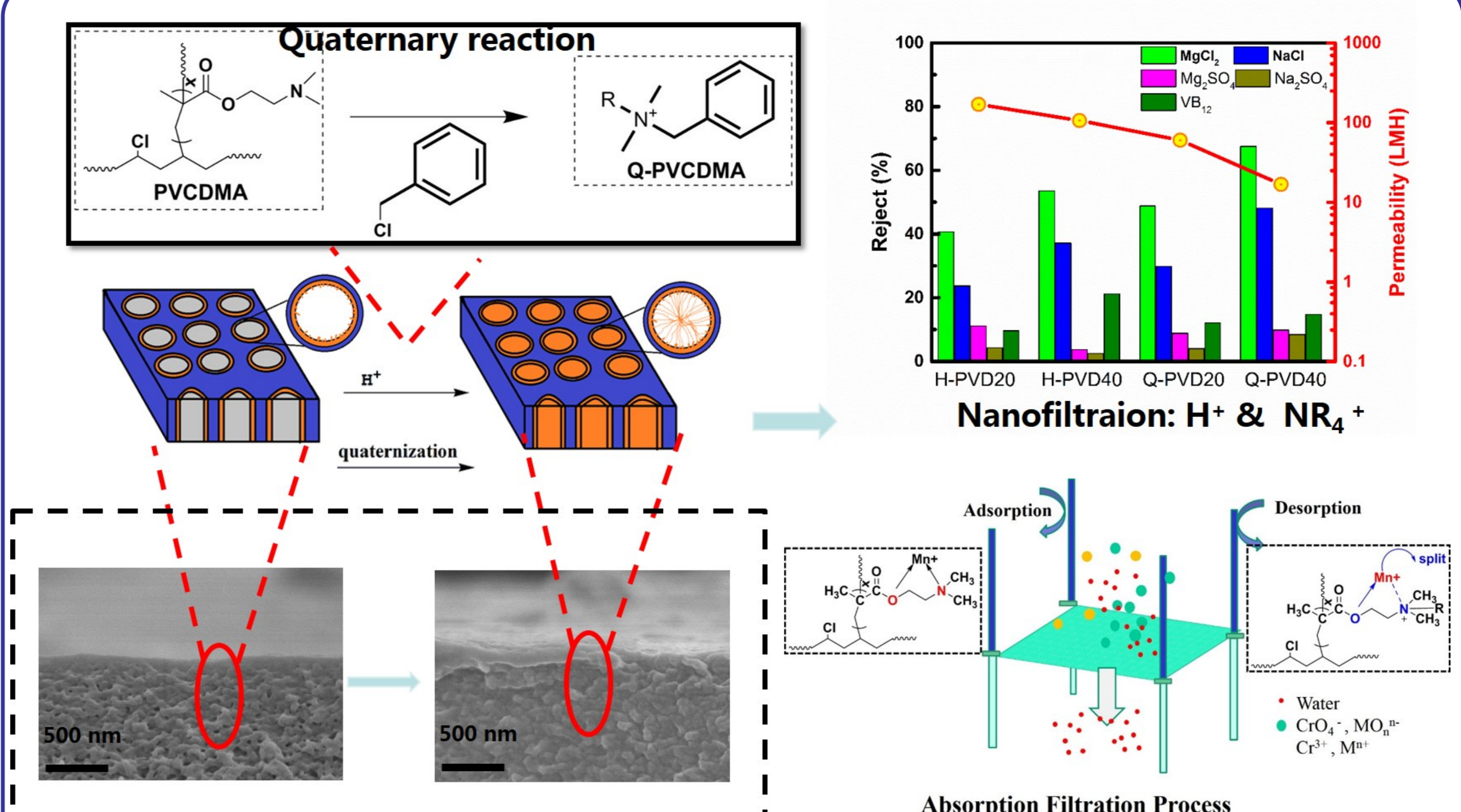


Fig. 5. Amine based amphiphilic PVC co-polymer absorption filtration membranes (AFMs) with heavy-metal ion removal

## Conclusions

A positively charged nanofiltration membrane was developed by microstructural tailoring based on a new synthesized copolymer PVC-g-PDMA. The membrane exhibited excellent separation performance in terms of water permeability ( $1 \sim 10 \text{ L m}^{-2} \text{ h}^{-1} \cdot \text{bar}^{-1}$ ) and salt rejection (60~95% with  $\text{MgCl}_2$  solution). Such a series of microstructural tailoring method offer us a approach to prepared nanofiltration membrane without the interfacial polymerization even can be used in the field such as municipal water purification, water softening, electrodialysis, blood purification, pervaporation, and direct methanol fuel cell and so on.

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