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# Internal cross-linked anion exchange membranes with improved dimensional stability for electrodialysis

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**Abstract:** Anion exchange membranes (AEMs) with a high ion exchange capacity, striking water uptake and excellent dimensional stability were prepared via an internal crosslinking networks strategy. Internal crosslinking networks were formed by reacting 4,4'-bipyridine with brominated poly (2,6-dimethyl-1,4-phenylene oxide) (BPPO). 4,4'-bipyridine not only provides a functional group but also comprises a cross-linking agent without requirements of post-functionalization. The variation of the 4,4'-bipyridine amount into the casting polymer solution was explored to regulate the performance of the anion exchange membranes, and the membrane properties were evaluated by AFM, ion exchange capacity (IEC), water uptake, the linear expansion ratio, tensile strength, thermal stability, membrane area resistance and electrodialysis experiments, etc. The results showed that the cross-linked membrane with the IEC of 1.98 mmol/g has much more outstanding dimensional stability (water uptake: 11.68%; swelling ratio：3.8%) than non-cross-linked BPPO-Tri membrane (water uptake: 53.26%; swelling ratio: 7.71%) and commercial Neosepta AMX membrane (water uptake: 60.29%; swelling ratio: 5.08%), at the high temperature (50 ℃). When being applied in ED application, the cross-linked BPPO-20 membrane (NaCl remove: 59.7%; energy consumption: 5.97 kWh/kg NaCl) exhibits slightly higher desalination efficiency and lower energy consumption than commercial Neosepta AMX membrane (NaCl remove: 58.3%; energy consumption: 6.51 kWh/kg NaCl), suggesting its promising application in ED.

**Keywords:** Anion exchange membranes (AEMs); Cross-linking networks; 4,4'-bipyridine; poly(2,6-dimethyl-1,4-phenylene oxide) (BPPO).

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