

NANOFILTRATION MEMBRANES FOR VANADIUM FLOW BATTERY APPLICATION

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Vanadium flow battery (VFB) is one of the most promising devices for smoothing the power output of renewable energy electricity from sources like wind, solar and etc. Exploring new membranes for VFB application is one of the most important tasks in this field. In our lab, Nanofiltration (NF) membranes with tunable porous structure were first proposed and used as separator for VFB application. Because the NF membrane could separate vanadium ions and hydrogen ions by their difference in size, charge density as well as transporting speed in electrolyte, the NF membranes are quite capable as the next generation separators for VFBs.

In our work, NF membranes with different materials (as PSF, PEEK, PES and PAN) and unique structure (as connected pores, closed posed) were prepared through normal phase inversion method. The membrane structure was well controlled with several kinds of minerals (like silica, titanium) and macromolecule additives (like PEG, PVP). Based on these membranes, the relationship between membrane structure and VFB performance was thoroughly studied. These membranes performed quite well when assembled in VFB single cell, and their battery efficiency even surpassed that of Nafion115[®] membrane. The results show that the NF membrane is quite promising as the next generation separator of VFB batteries.

