Zwitterionic Membranes for Vanadium Redox Flow Batteries

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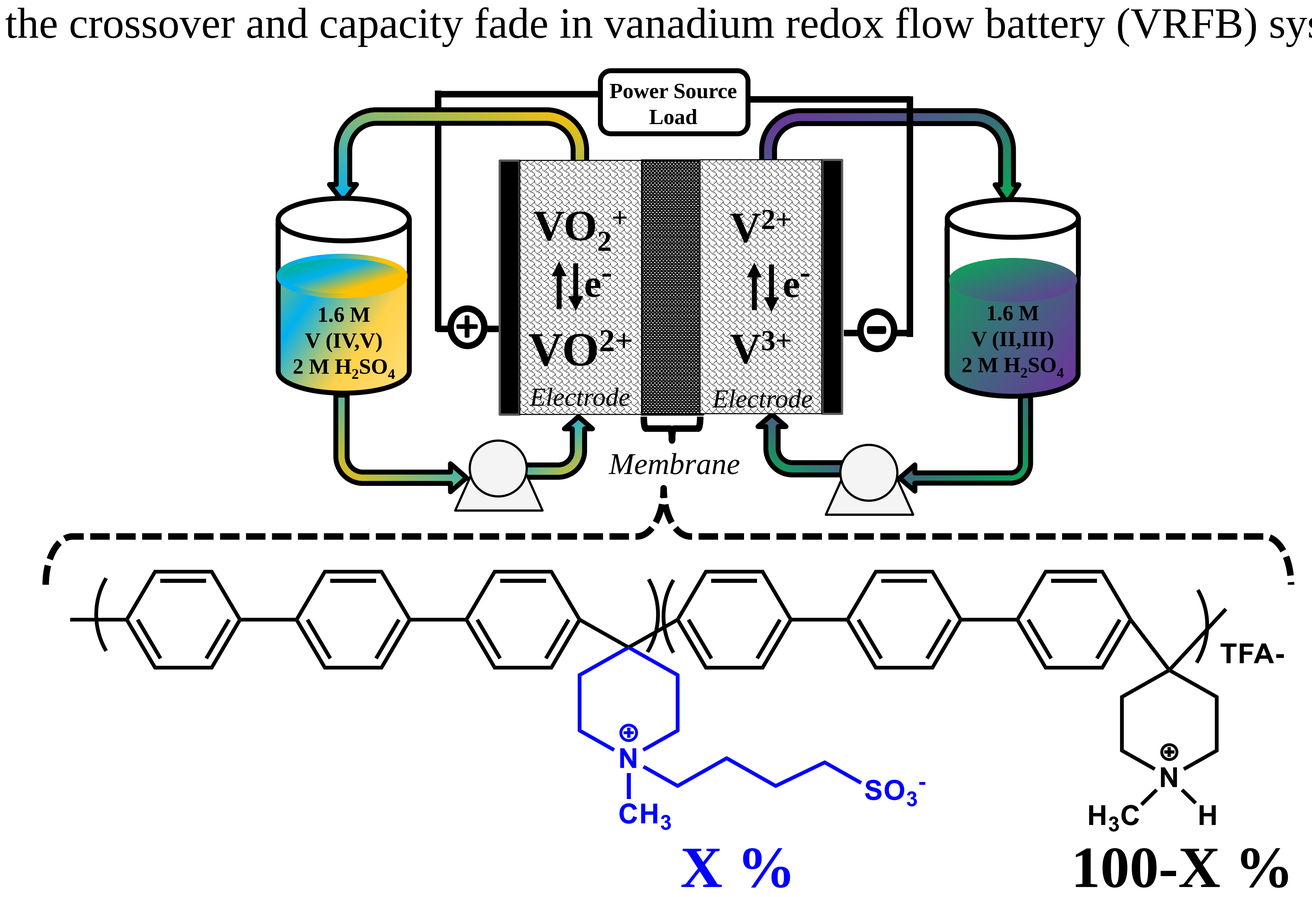
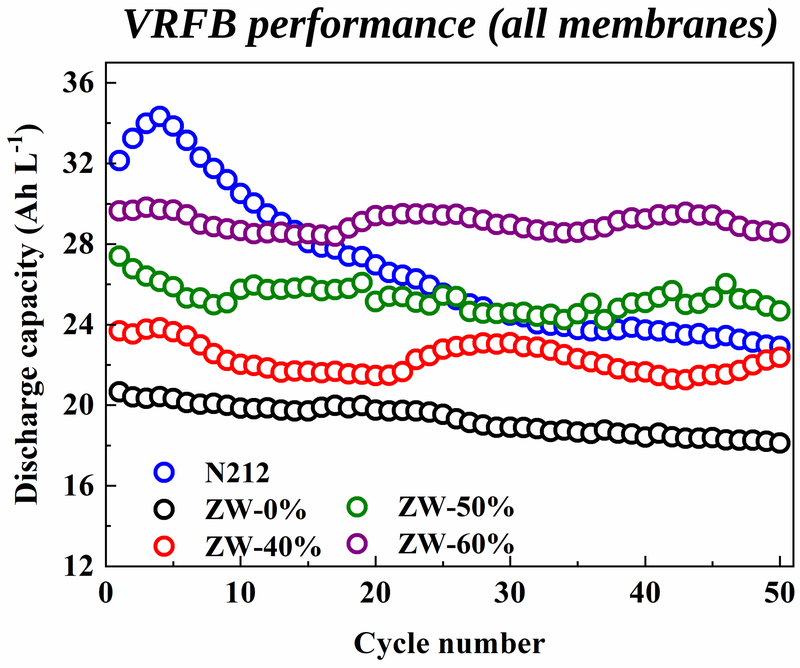
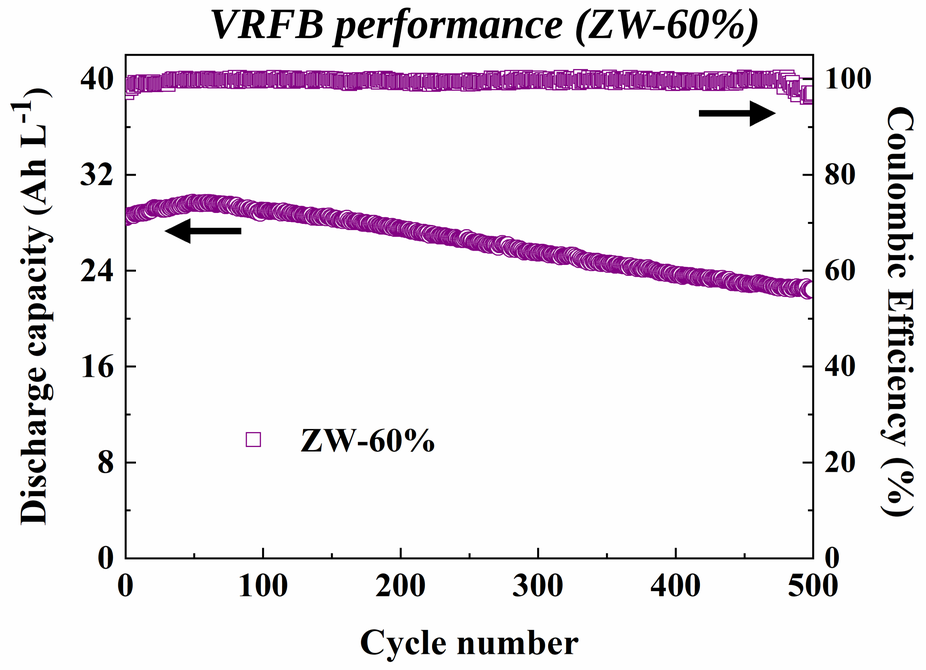
Aim: The main goal of this work is to combine the anionic and cationic features in poly(terphenyl)-based zwitterionic membranes (ZW) containing zwitterionic units (sulfoalkylated piperidinium) and piperidinium groups in different ratios and monitor how this combination may influence the crossover and capacity fade in vanadium redox flow battery (VRFB) systems.



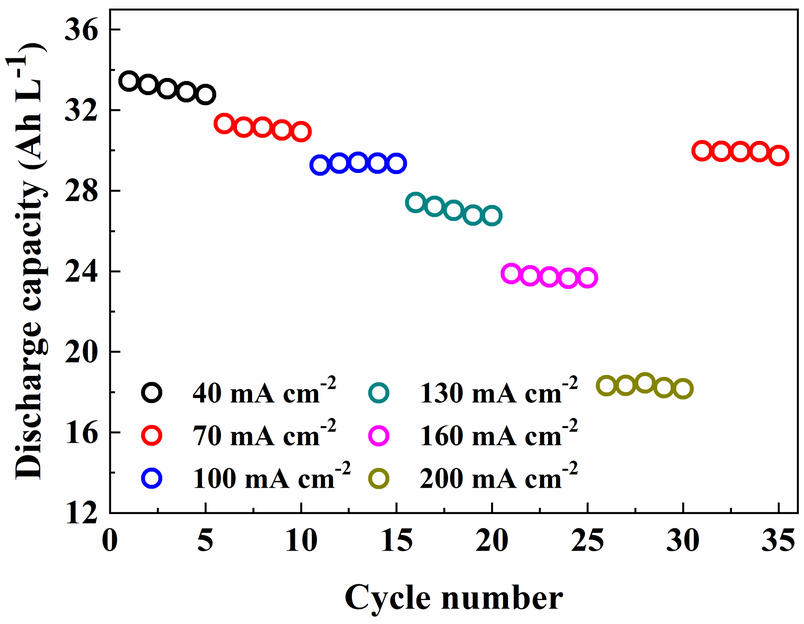
VRFB performance (all membranes)



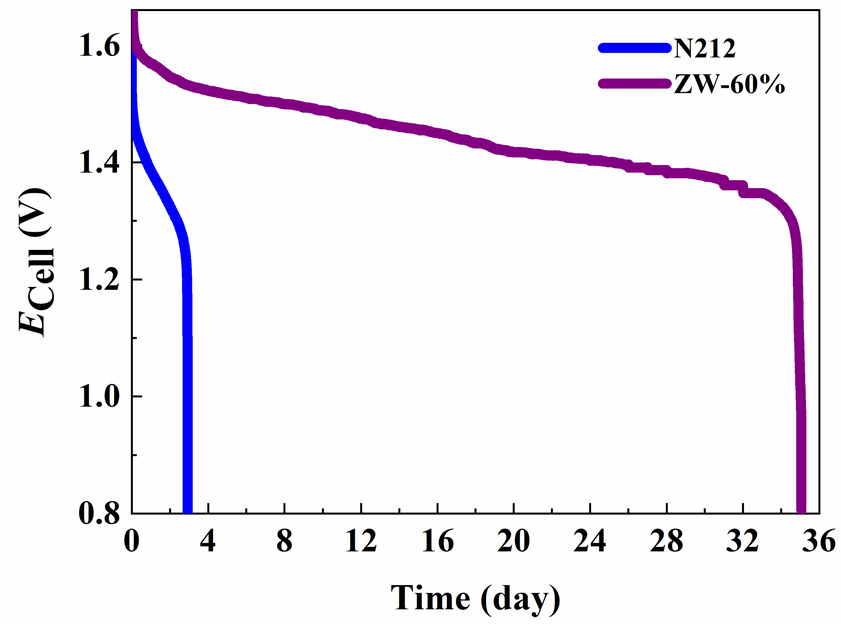
VRFB performance (ZW-60%)

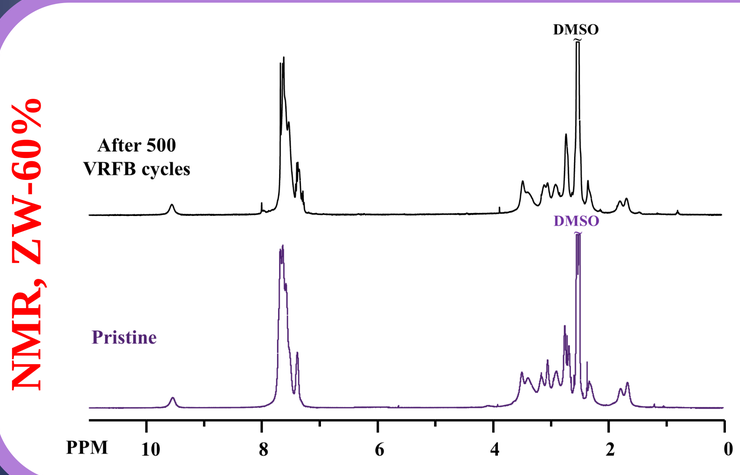


Rate performance (ZW-60%)



Self-discharge (ZW-60%)





Conclusions

Among synthsized membranes, the VRFB using ZW-60% showed the best performance due to the superior capacity retention obtained in comparison with the other studied membranes. Also, the NMR analysis revealed that the ZW-60% has an excellent (electro)chemical durability over 500 cycles.

Swedish Energy Agency