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Preparation of Dense Polybenzimidazole Proton Exchange Membranes with Different Basicity and Flexibility for Vanadium Redox Flow Battery Applications

Liming Ding^a, Xipeng Song^b, Lihua Wang^{b,*}, Zhiping Zhao^{a,*}, Gaohong He^c

^a School of Chemistry and Chemical Engineering, Beijing Institute of Technology, Beijing 102488, PR China. *E-mail: zhaozp@bit.edu.cn

^b Key Laboratory of Green Printing, Institute of Chemistry, Chinese Academy of Sciences, Beijing, 100190, PR China. *E-mail: wanglh@iccas.ac.cn

^c State Key Laboratory of Fine Chemicals, R&D Center of Membrane Science and Technology, School of Chemical Engineering, Dalian University of Technology, Dalian, 116023, PR China.

Abstract:

Acid doped polybenzimidazoles (PBI) membrane is a type of promising proton exchange membrane for vanadium redox flow battery (VRFB) applications and increasing the basicity of PBI is an effective way to develop the acid doped level and proton conductivity. While according to Grotthuss mechanism, the proton conduct in PBI membranes can occur from protonated guest molecules to neighbor non-protonated neighbor molecules. Therefore, the flexibility of the polymer also can influence the proton conductivity of PBI membranes. In order to investigate in VRFB system which factor is more obvious, in this article, three PBI compounds with different basicity and flexibility were synthesized and then used to prepare dense proton exchange membranes for VRFB applications. The physicochemical properties and single cell performances of these membranes were valued. The results indicated that in VRFB system, the most flexible OPBI membranes show the highest proton conductivity. The VRFB

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