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Electronic Supplementary Information

Systematic stability investigation of perfluorosulfonic acid membranes with varying ion exchange capacities for fuel cell application

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Experimental

Surface morphology of the membranes

PFSA membranes with various IEC values were boiled in 3 vol% H_2O_2 solution and 1 M H_2SO_4 at 80 °C for 1 h, respectively. And then, the membranes were boiled in deionized water for 1 h and repeatedly washed in fresh water until pH = 7. The treated membranes were dried in a vacuum oven at 80 °C for 2 h.

Surface morphology of all PFSA membranes before Fenton test was observed by scanning electron microscopy (SEM). Additionally, for better understanding the changes of the membranes during Fenton test, the morphology of the membranes after being immersed in 30 vol% H_2O_2 solution without addition of Fe^{2+} at 80 °C for 120 h was also examined. The results are depicted in Fig. S1. Clearly, all PFSA membranes before Fenton test show very smooth surfaces. There are also no obvious changes even when the membranes were immersed in H_2O_2 solution for 120 h. The results indicate that the appearance of bubbles and pinholes on the membrane surfaces after Fenton test are caused by degradation rather than the self-swelling in pure H_2O_2 solution. Therefore, the

damage degree of the membranes during Fenton test can be used to evaluate their chemical durability.

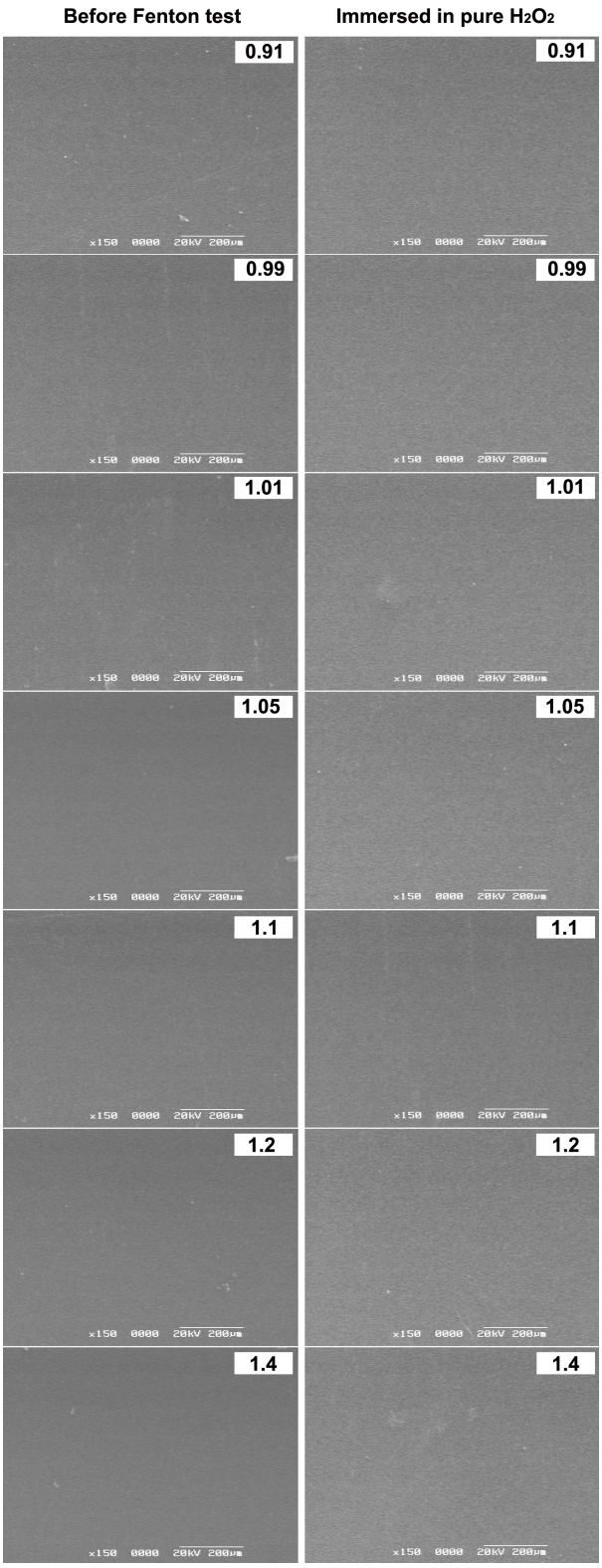

Fig. S1 SEM images of PFSA membranes with various IECs before Fenton test (left) and after being immersed in 30 vol% H_2O_2 solution for 120 h (right).