Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supporting Information

In-Situ Synthesis of MOFs/PAA Hybrid with Ultrahigh Ionic Current Rectification

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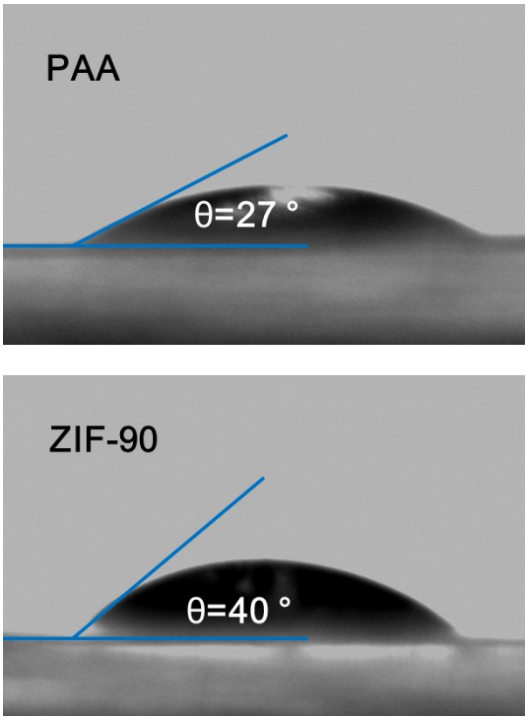

Fig. S1 Surface contact angle measurements on MOFs/PAA hybrid. The upper is on the PAA side, and the bottom is on the ZIF-90 side.

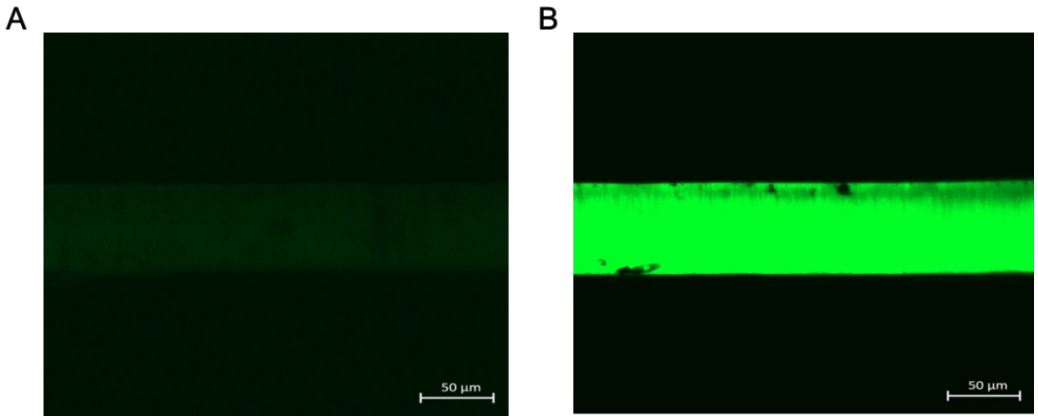

Fig. S2 The LSCM cross-section of (A) pure PAA and (B) APTES-modified PAA.

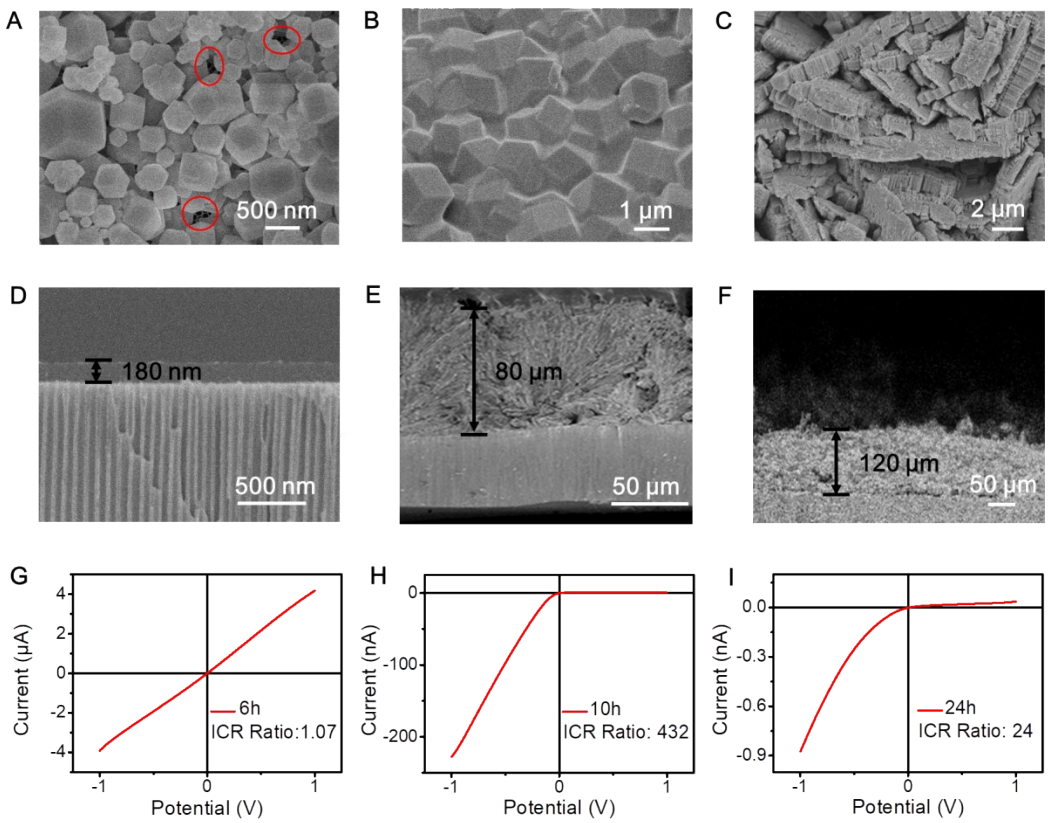

Fig. S3 (A-C) SEM morphologys of the top surface with different reaction time, 6 h (A), 10 h (B), 24 h (C). (D-F) SEM morphologys of the cross section with different reaction time, 6 h (D), 10 h (E), 24 h (F). (G-I)*I-V* curves of the hybrid obtained at reaction time of 6 h (G), 10 h (H), 24 h (I), respectively, in 1 mM KCl at pH 11. 10 h was chosen due to the excellent ICR property of the fabricated hybrid.

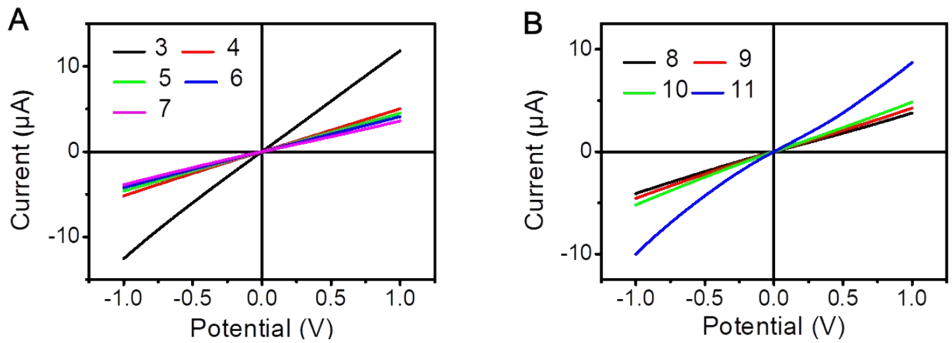

Fig. S4 *I–V* curves of pure PAA membrane in 1 mM KCl solution at different pH values.

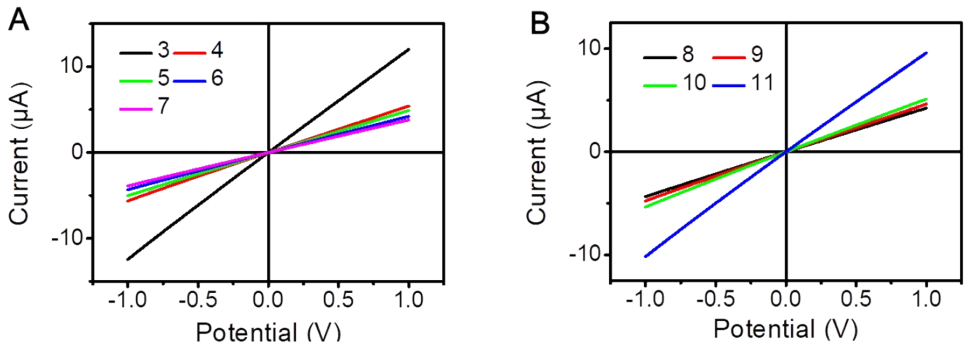

Fig. S5 *I–V* curves of APTES modified PAA membrane in 1 mM KCl solution at different pH values.

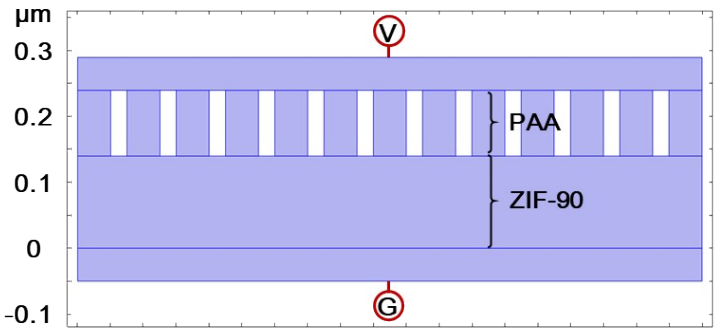

Fig. S6 Simulation model. Thirteen nanochannels with length of 0.1 μm and diameter of 50 nm are used to represent the nanochannels in PAA layer, while the ZIF-90 layer is modeled as an area of 0.95 μm in width and 0.14 μm in height.

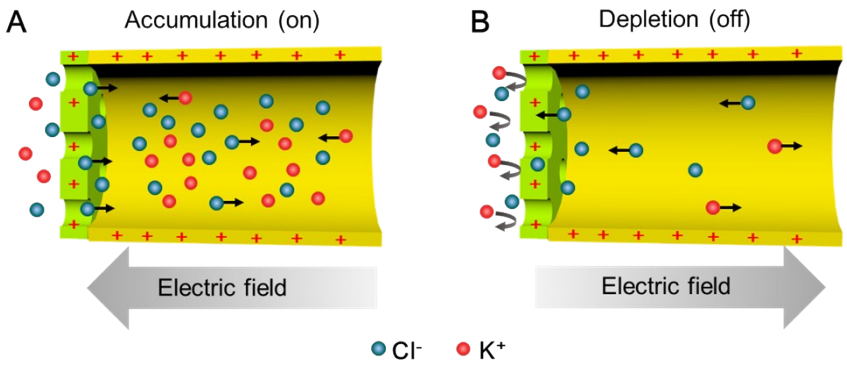

Fig. S7 Illustration of the ICR mechanism under acidic enveriment in 1 mM KCl (A: Accumulation (on), which comes from efficient ion concentration enrichment in the hybrid; B: Depletion (off), which results from remarkable ion concentration decrease in the hybrid).

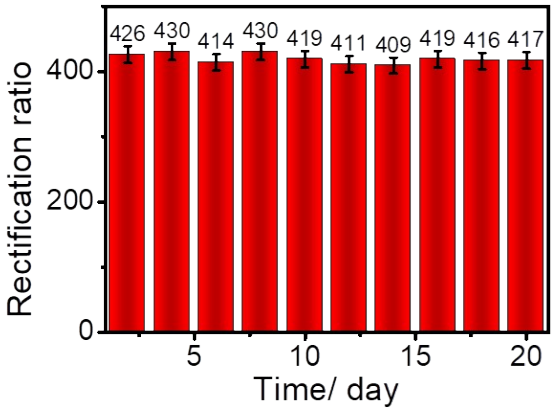

Fig. S8 The ion rectification ratios for nanochannel-ionchannel hybrid membrane in 1mM KCl at pH of 11 within 20 days.

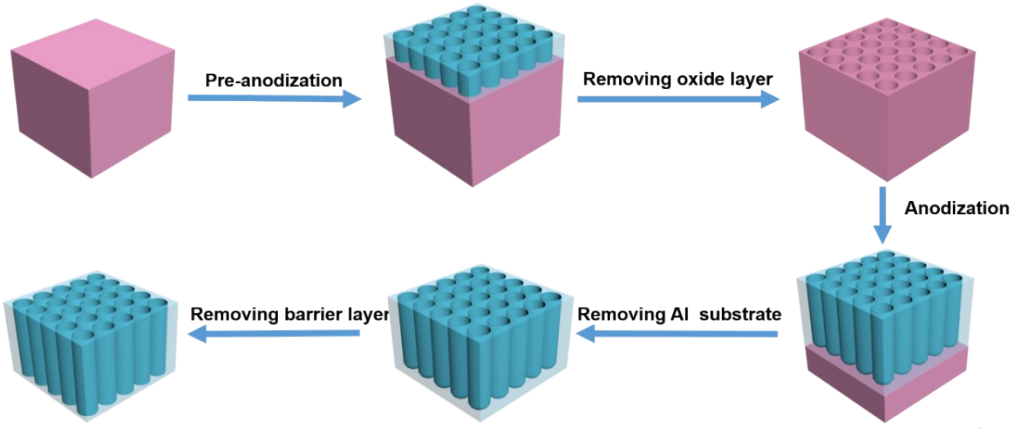

Fig. S9 Preparation of PAA membrane by two-step anodization method.