## A self-humidifying proton exchange membrane embedded with phosphonic acid-functionalized mesoporous silica nanoparticles that has excellent dispersion and water retention

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Fig.S1 <sup>1</sup>H NMR spectrum of the MSN(-NH<sub>2</sub>) and VPA-MSN(-NH<sub>2</sub>)





Fig.S2 <sup>13</sup>C NMR spectrum of the (a) MSN(-NH<sub>2</sub>), (b) at the beginning of the reaction between VPA and MSN (mixed the MSN and VPA) and (c) the reaction between VPA and MSN were lasted 6h.