

## RSC Advances Supporting Information

### Quaternized Mesoporous Silica/polysulfone Composite Membrane for an efficient alkaline fuel cell application

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#### FT-IR:

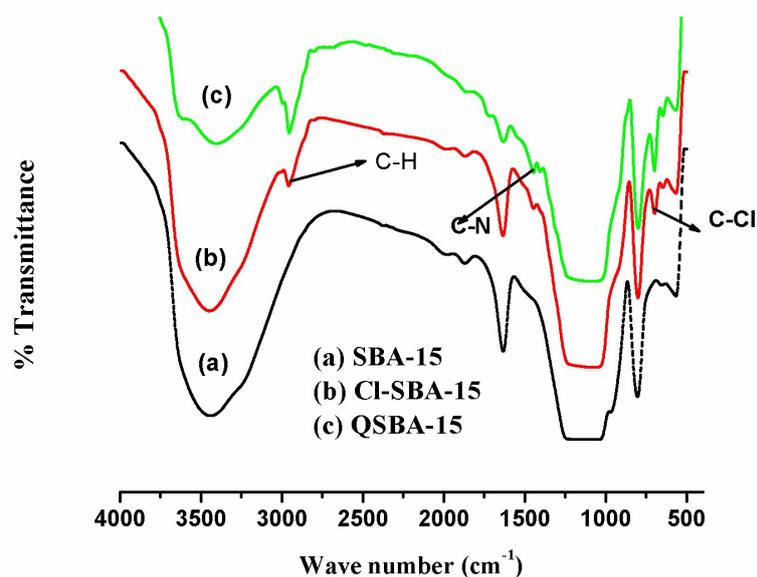


Fig. SF-1 FTIR spectrum of SBA-15(a), CMSBA-15(b) and QSBA-15(c)

FT-IR spectrum of SBA-15(a), CMSBA-15(b) and QSBA-15(c) are shown in the fig.2. Pure SBA-15 shows the well-known IR absorption bands. The stretching vibration of O-H in the silanol groups was observed in the range of 3600-3400 cm<sup>-1</sup>. The bands at around

1620 $\text{cm}^{-1}$  can be attributed to bending vibrations of O-H bonds and the bands at 1080 $\text{cm}^{-1}$  due to asymmetrical stretching vibraton of Si-O-Si bonds. The bands at 960  $\text{cm}^{-1}$  were due to the stretching vibrations of free silanol (Si-OH) groups on the surface of the amorphous silanol samples. Symmertical stretching vibrations of Si-O-Si bonds belonging to ring structures were observed around 795-790  $\text{cm}^{-1}$ . In fig (b) two new bands assigned to CH<sub>2</sub> and C-Cl appeared at 2929  $\text{cm}^{-1}$  and at 702  $\text{cm}^{-1}$  respectively. The peaks confirmed that the surface has been successfully functionalized with chloromethyl group<sup>28</sup>. In spectrum c, which corresponds to quanternized functionalized SBA-15(Q-SBA-15) N-C stretching appeared at 1452  $\text{cm}^{-1}$  and intensity of CH<sub>2</sub> peak increased due to the increase of methyl group in quaternary ammonium.

### Paticle size

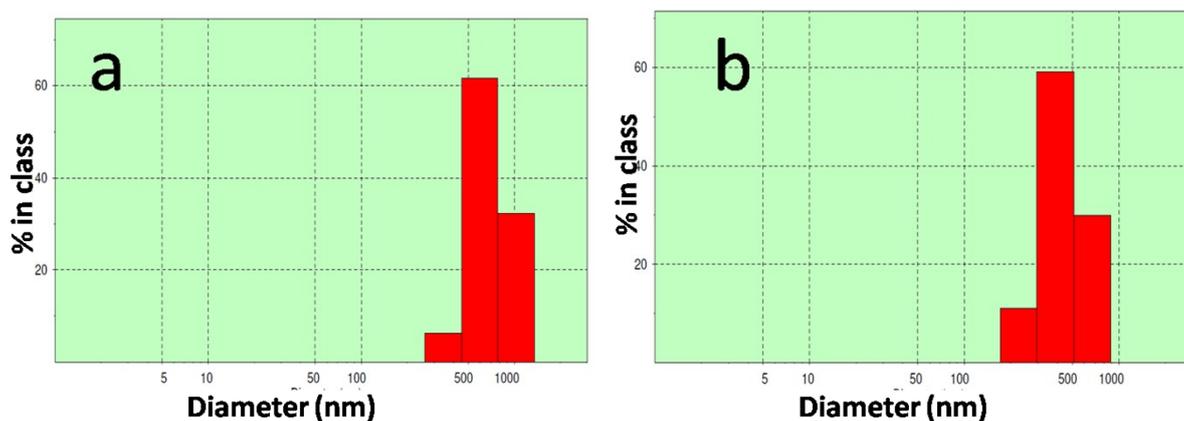


Fig.SF-2 Particle size of SBA-15(a) and QSBA-15(b)

### EIS Nyquist Plot

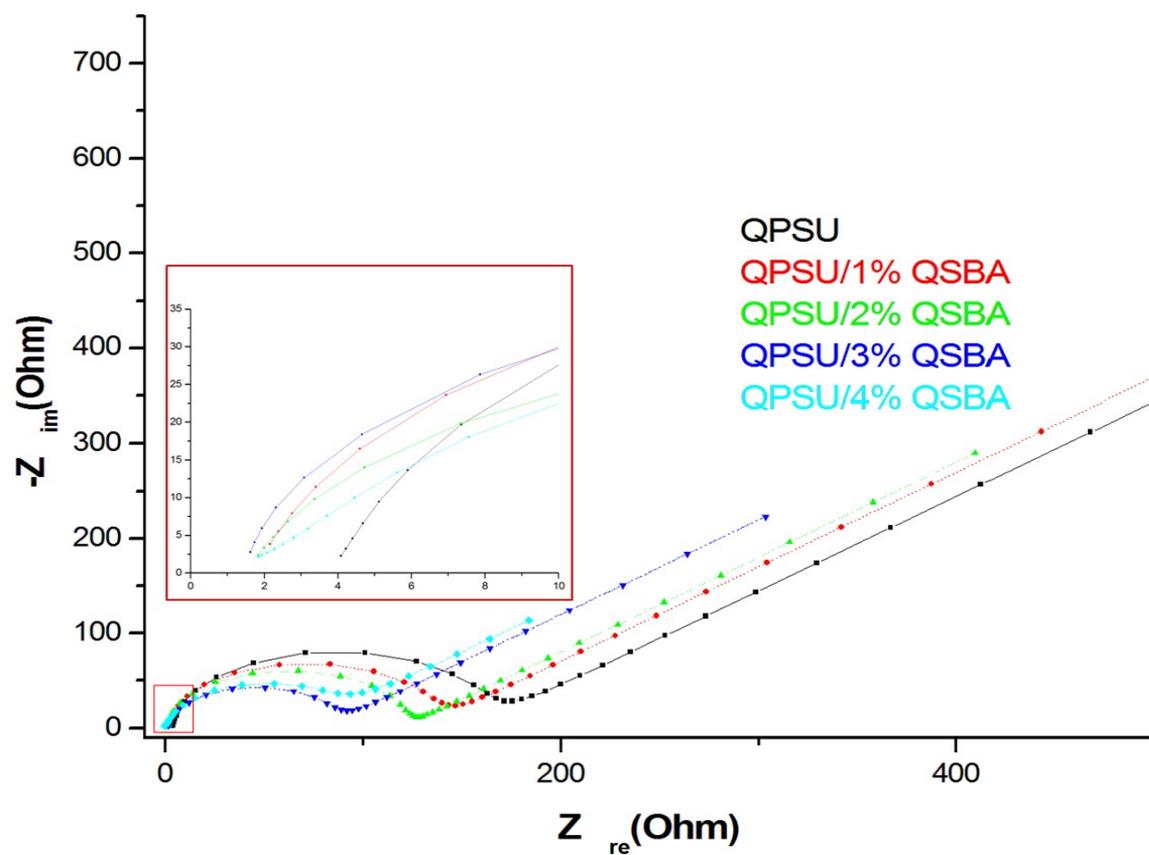


Fig.SF-3 EIS Nyquist Plot for composite membrane