

## Supporting Information for

### **Synthesis, characterization of octaimidazolium-based polyhedral oligomeric silsesquioxanes ionic liquid by ion-exchange reaction**

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## Experiment

### Materials

$\gamma$ -Chloropropyltrimethoxysilane was purchased from Shandong Qiquan Silicon Co., Ltd. 1-Methylimidazole was purchased from Aladdin Chemical Reagent Co., Ltd. methanol, toluene, n-hexane, and sodium dodecyl sulfate were obtained from Sinopharm Chemical Reagent Beijing Co., Ltd. Methanol was purified by published methods before use. The other reagents were used as received. Triply distilled water was used to prepare all the solutions

### Characterization

$^1\text{H}$ ,  $^{13}\text{C}$ , and  $^{29}\text{Si}$  NMR spectrums were recorded using a Bruker AV 300 spectrometer in chloroform-d,  $\text{D}_2\text{O}$  or methanol-d. Fourier transform infrared (FT-IR) spectrum was measured with a Nicolet FT-IR spectrometer using anhydrous KBr pellets. Differential scanning calorimetry (DSC) was carried out on a Rheometric Scientific DSC SP at heating rate of 10 K/min under nitrogen atmosphere. Thermogravimetric analysis (TGA) measurement was performed with a METTLER TOLEDO TGA/DSC-1 thermogravimetric analyzer over temperature range from 25 to 800 °C at heating rate of 10 °C/min under nitrogen atmosphere. Before TGA experiment, an isothermal segment was carried out under nitrogen atmosphere (125 °C for 20 min).

### Preparation of POSS-min-Cl

POSS-Pr-Cl (4.0 g, 0.004 mol) was added to toluene (15 ml), while stirring with magnetic stirrer for 3 min in order to dissolve absolutely, and the 1-methylimidazole (7.8 g, 0.095 mol) was added to the mixture at nitrogen atmosphere with a reflux

condenser, then the solution was heated to 90 °C in an oil bath. Initially, the reaction solution was transparent, as the quaterization reaction proceeded (after 1.5 h of the reaction), the solution became opaque indicating the formation of POSS-min-Cl. After stirring for 2.0 h, the POSS-min-Cl began to precipitate from the suspension; the solution can not stir and keep on heating for another 1 h. after the reaction was completed, the liquid descent from and the residual wash with hot toluene and hexane several times. Finally, a transparent product was obtained by dried at 60 °C in vacuum. IR (KBr, cm<sup>-1</sup>): 3102, 2955, 2896, 1640, 1574, 1456, 1130, 762. Elemental analysis: Calc. H 5.71, N 13.23, C 39.71; Found H 5.73, N 13.19, C 39.64 %.

#### Preparation of POSS-min-DS

The POSS-min-DS was prepared by metathesis reaction, the sufficient SDS aqueous solution (0.05 mol/l) was dropped into POSS-min-Cl aqueous solution (0.10 mol/l) under stirring at room temperature, and white precipitate appeared immediately. After an hour's continuous stirring, the precipitate was separated by a centrifugal machine, washed by triply distilled water 20 times, and was further dried in vacuum. IR (KBr, cm<sup>-1</sup>): 3105, 2925, 2857, 1637, 1568, 1456, 1219, 1112, 1038, 918.

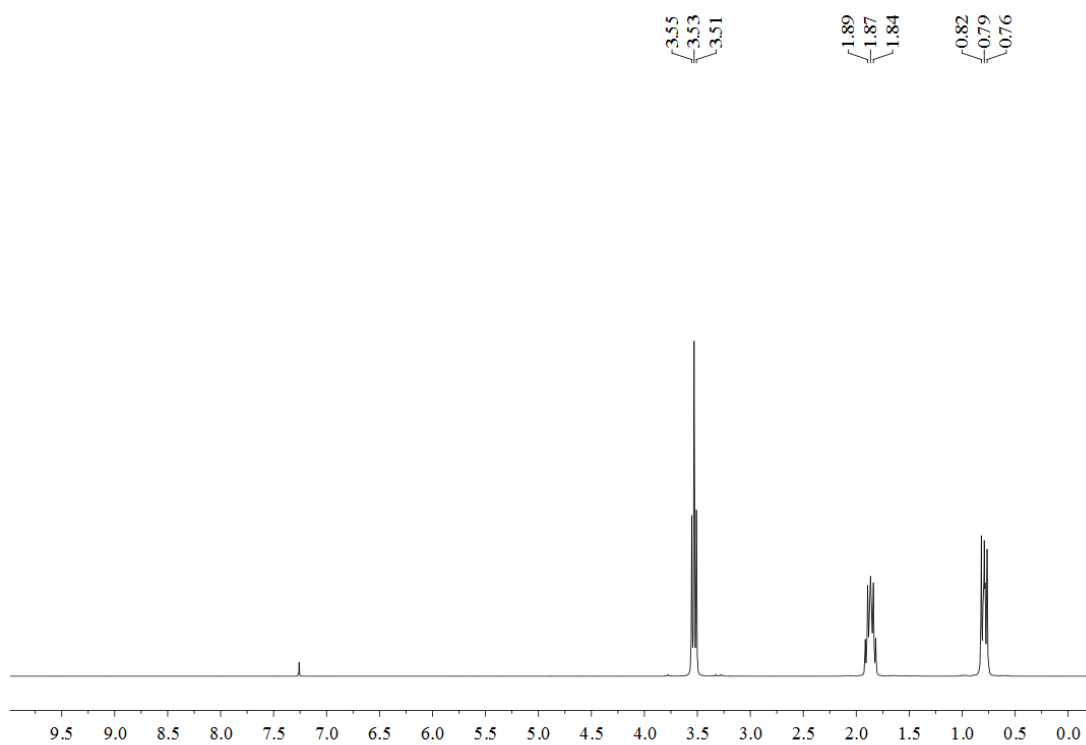


Figure S1 <sup>1</sup>H NMR spectrum of POSS-Pr-Cl

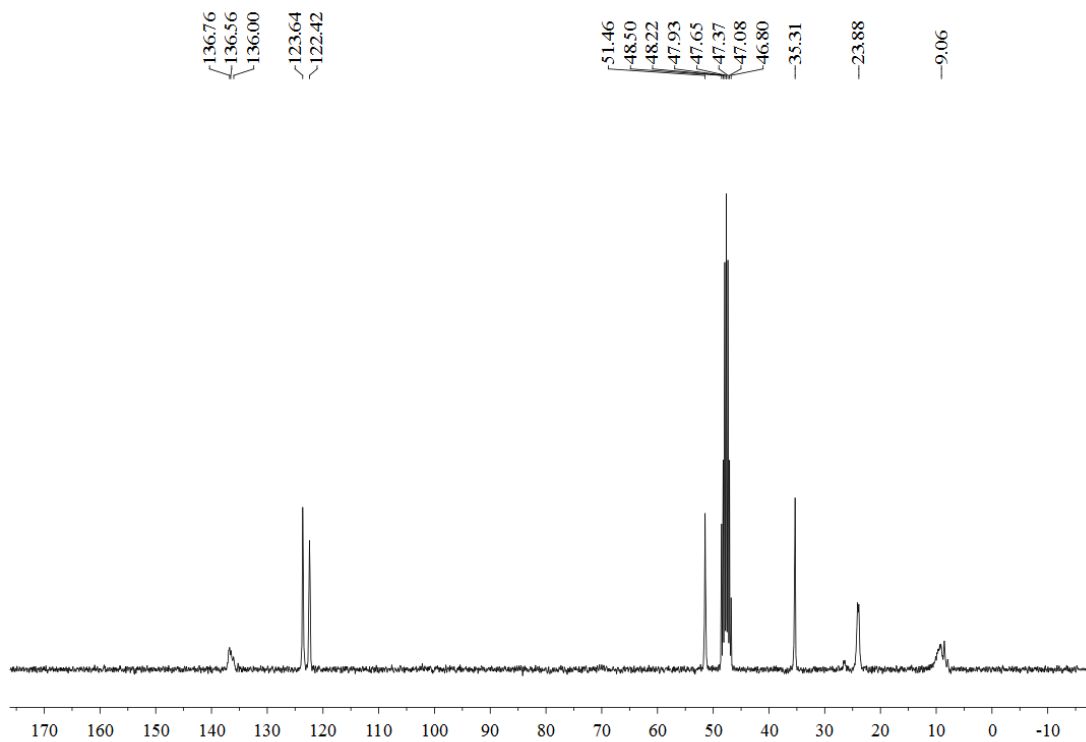


Figure S2 <sup>13</sup>C NMR spectrum of POSS-min-Cl

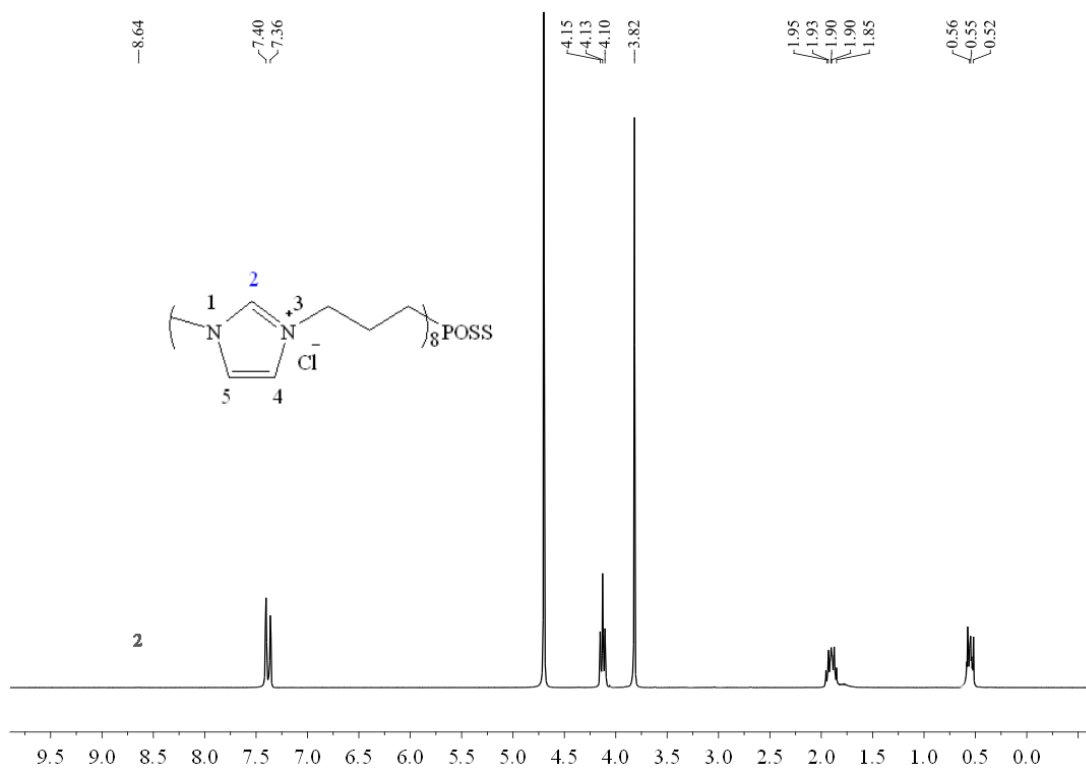


Figure S3 <sup>1</sup>H NMR spectrum of POSS-min-Cl

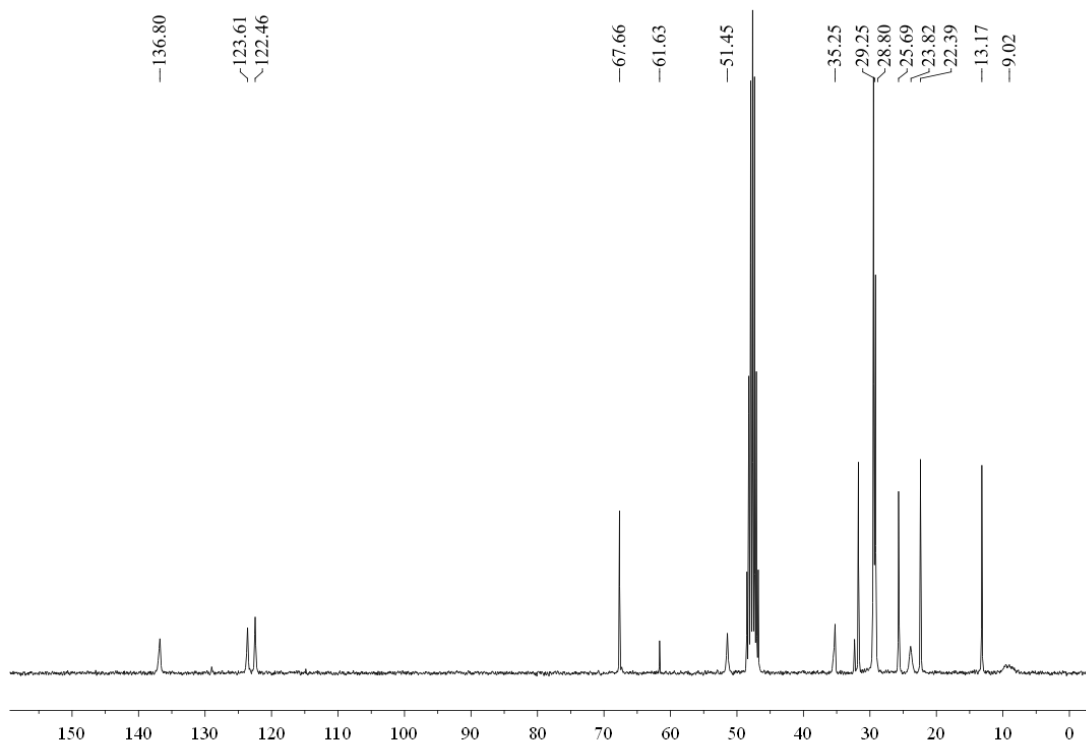


Figure S4 <sup>13</sup>C NMR spectrum of POSS-min-DS

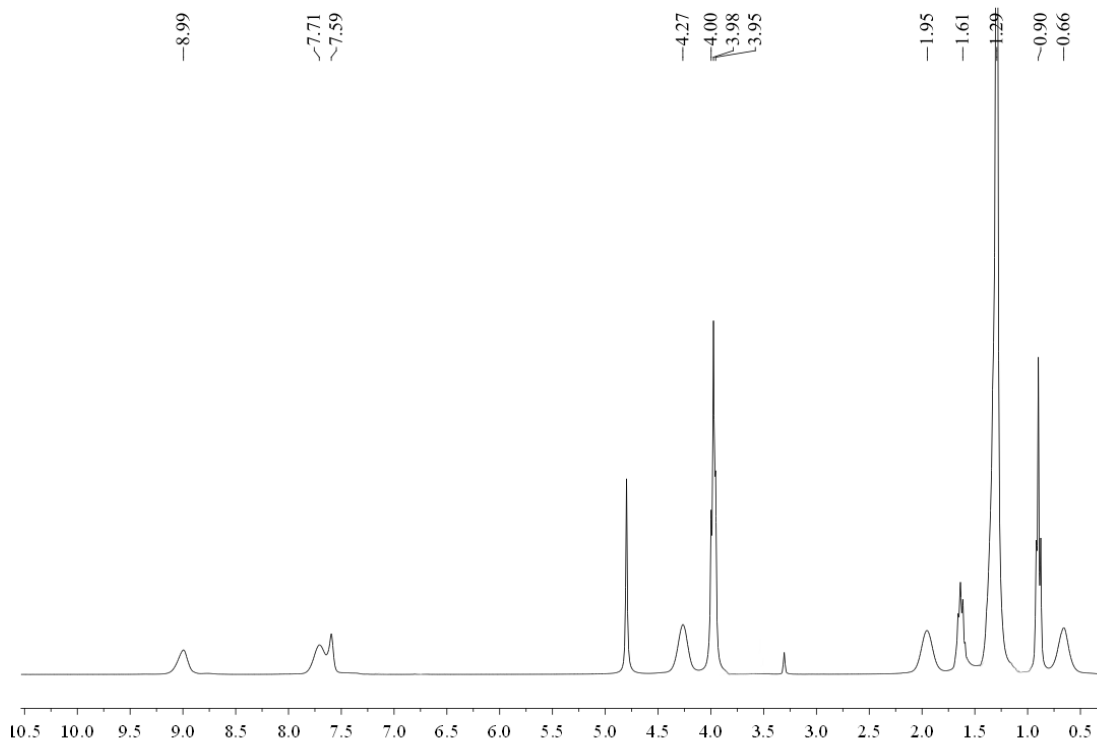


Figure S5  $^1\text{H}$  NMR spectrum of POSS-min-DS

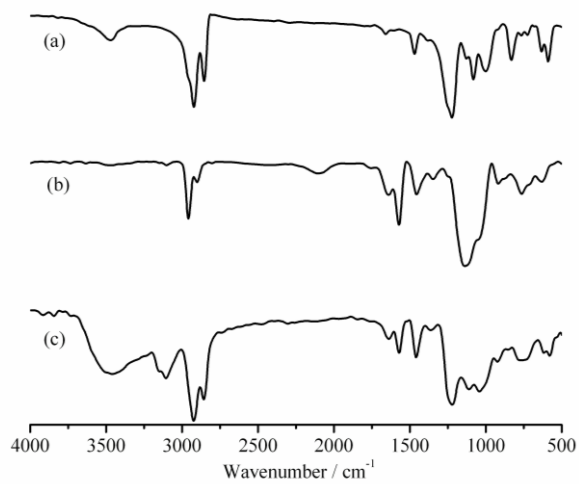


Figure S6 FT-IR spectrum of SDS (a), POSS-min-Cl (b), and POSS-min-DS (c)