Supporting Information

A series of model fuels (100 ppm, 200ppm,300 ppm,400 ppm,500 ppm,600 ppm,700 ppm,800 ppm,900 ppm, and 1000 ppm) were prepared previously. Then, the standard curves of sulfur content vs. percentage of detecting peak area were detected by GC. It could be found that every S-containing compounds with its peak area kept linear relation (Figure 1).

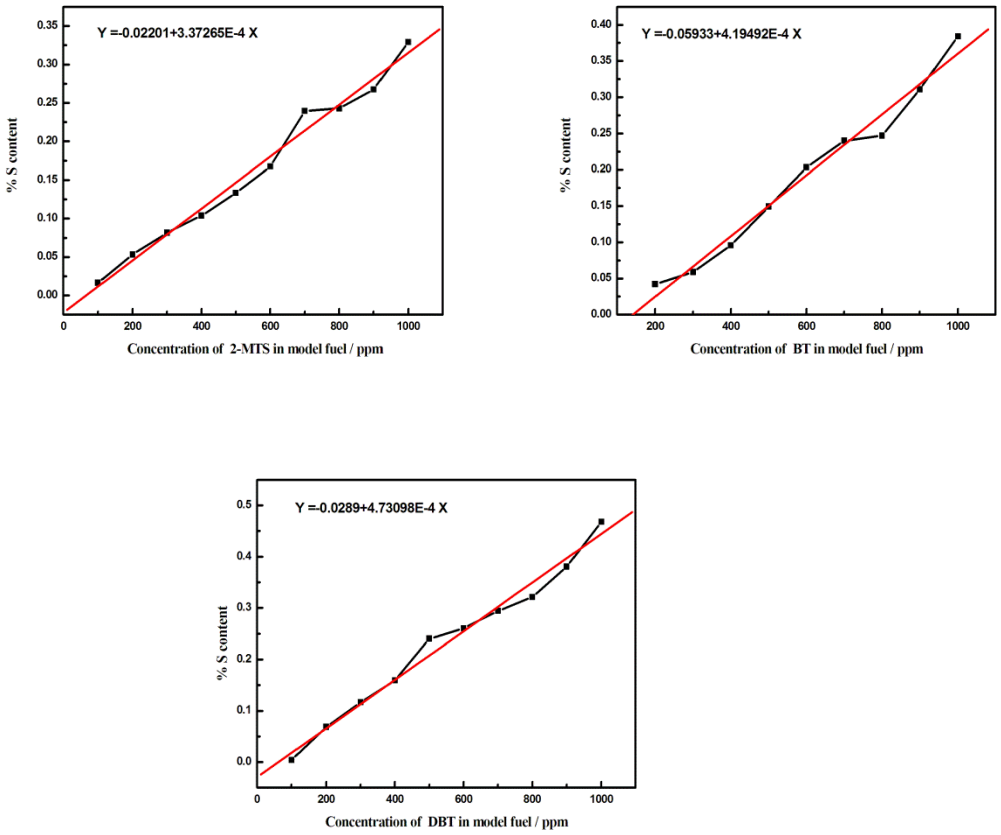

Figure 1. The linear relationships between the concentrations of S-containing compounds (2-MTS, BT, DBT) and percentage of peak area.

EDS further detected the element contents of SILs-SG and SPILs-SG. The percentages of C, N, O, F, Si and Cl were displayed in Figure 2 and Table 1. Wt % meant element's mass

percentage content. It could be seen that the appearance of C, N, O and Cl on SILs-SG proved imidazolium chloride ILs had been successfully loaded on the surface of SG. For SPILs-SG, the reduced content of Cl and increased content of F which was clearly shown in Figure 2 had proved imidazolium tetrafluoroborate ILs were grafted on SPILs-SG.

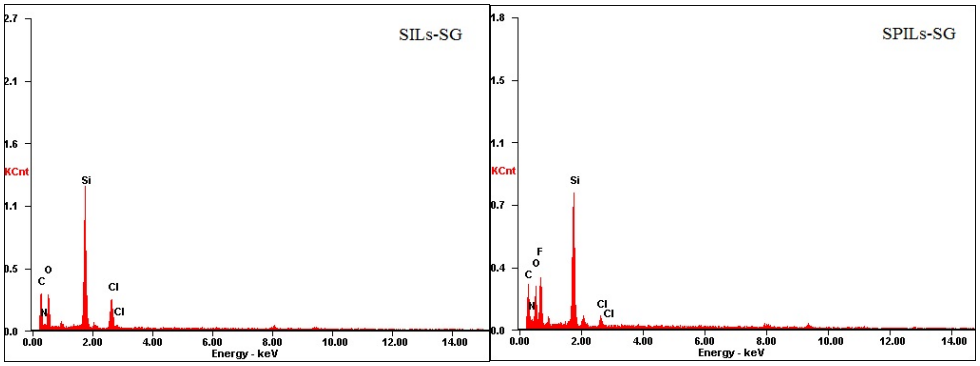

Figure 2. EDS of SILs-SG and SPILs-SG.

Table 1. EDS results of SILs-SG and SPILs-SG

Sample	C (wt%)	N (wt%)	O (wt%)	F (wt%)	Si (wt%)	Cl (wt%)
SILs-SG	17.68	10.97	34.47	-	27.91	8.97
SPILs-SG	11.92	13.14	22.37	28.70	21.62	2.26

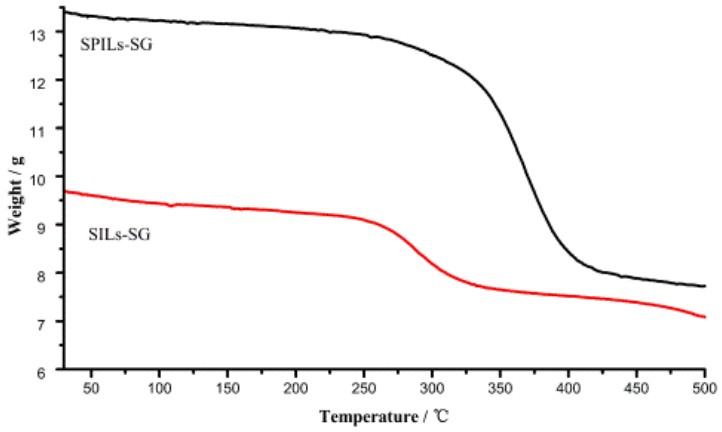

Figure 3. Thermogravimetric analysis of SILs-SG and SPILs-SG.

Thermogravimetric analysis data for SILs-SG and SPILs-SG could be seen in Figure 3. The amount of supporting ILs or polymeric ILs could also be estimated by weight loss under thermal treatment. The weight loss of SILs-SG up to 250 °C was attributed to loaded 1-vinyl-3-(triethoxysilylpropyl)imidazolium chloride, while the weight loss of SPILs-SG above 350 °C was mainly attributed to supported poly-1-vinyl-3-ethylimidazolium tetrafluoroborate. SILs-SG exhibited 14.7 % weight loss from 250 °C to 330 °C, while SPILs-SG had a total weight loss of 36.4% from 350 °C to 400 °C. The high thermal stability of SPILs-SG also provided the evidence of covalent attachment and implied its ability to withstand leaching during desulfurization experiments.

Molecular weight of the graft polymers was measured with Gel Penetration Chromatography equipped with OHpak-803 columns. 0.25g SPILs-SG was dissolved in 1.955 mol / L sodium hydroxide (10 ml). The mixture was vigorously stirred and SPILs-SG was dissolved completely. And then the aqueous solution was rotary evaporated at 50°C. The obtained power of polymeric ILs was dried under vacuum at 80°C, and then subjected to GPC measurement. The average

molecular weight was about 7326 g / mol, the weight-average molecular weight and number average molecular weight were M_w = 8308 g / mol and M_n = 7852 g / mol respectively. The grafting density α (μmol / m^2) of the SPILs-SG was calculated by the following equation[1-3]:

$$\alpha = \frac{N_N \Gamma_{SPILs-SG} M_N}{M_w n_N} \frac{1}{S} \qquad (1)$$

where $\Gamma_{SPILs-SG}$ was the loading amount of poly-1-vinyl-3-ethylimidazolium tetrafluoroborate detected by elemental analysis, N_N was the number of nitrogen in one of the grafting group, M_N was the relative atomic mass of N, M_w was the molecular weight of the grafted group, n_N was the percent nitrogen in the grafted group, and *S* (344 m^2 / g) was surface area of SG which was offered by Jinan Bona biological technology Co., Ltd. . The grafting density of SPILs-SG was 0.254 μmol / m^2.

References

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(2) Kamiusuki, T.; Monde, T.; Yano, K.; Yoko, K.; Konakahara, T. Preparation of Branched-Polyfluoroalkylsilane-Coated SilicaGel Columns and their HPLC Separation Characteristics. *Chromatographia* **1999,** *49,* 649.

(3) Leonid, I.; Sergiy, M. Mixed Polymer Brushes with Locking Switching. *Appl. Mater. Interfaces* **2012,** *4,* 483.