Electronic Supplementary Material (ESI) for RSC Advances

Enhancing desulfurization performance by introducing phenoxyls in polyphosphazene membrane

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1. ^{31}P, ^{1}H-NMR spectrum for poly [bis (phenoxy) phosphazene].
2. Differential scanning calorimetric analysis for poly [bis (phenoxy) phosphazene].
3. FTIR-ATR of poly [bis (phenoxy) phosphazene].

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1. ^{31}P-NMR spectrum for poly [bis (phenoxy) phosphazene].

Fig. S1 shows the ^{31}P and ^{1}H-NMR spectrum of poly [bis (phenoxy) phosphazene] (PBPP). The investigation was conducted in $CDCl_3$ by nuclear magnetic resonance chemical analyzer (600MHz, JNM-ECA600, JEOL Co., Japan). The chemical shift for PBPP in ^{31}P-NMR is *-19.1* ppm which is good accordance with literatures[1]. A single peak means Cl atoms have been completely replaced by phenoxyls. The chemical shifts in ^{1}H-NMR spectrum is listed as follows (ppm): *6.9, 7.1, 7.16.*

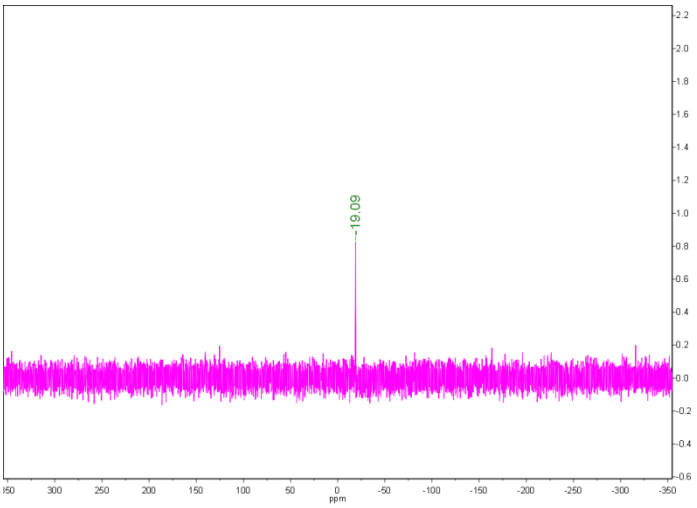

Fig. S1(a) ^{31}P-NMR spectrum of poly [bis (phenoxy) phosphazene]

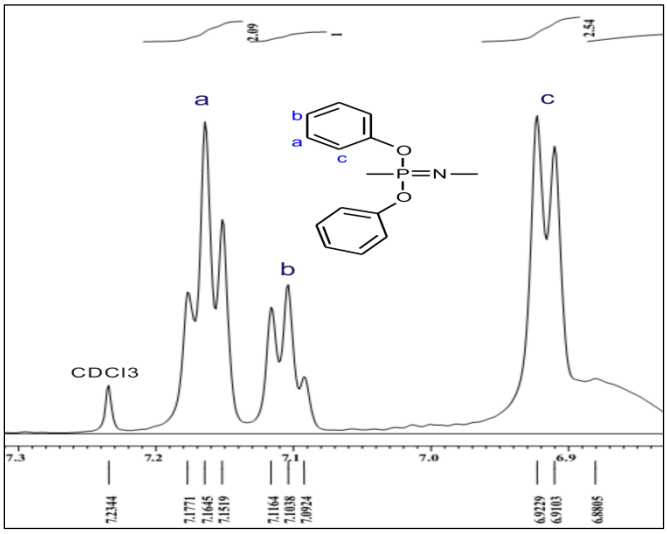

Fig. S1(b) ^{1}H-NMR spectrum of poly [bis (phenoxy) phosphazene]

2. Differential scanning calorimetric analysis for poly [bis (phenoxy) phosphazene]

The glass transition temperature (T_g) was measured by differential scanning calorimetry (DSC, Seiko Instruments Inc., DSC6200) at a heating rate of 10 °C / min from -100 °C to 20 °C. The recorded T_g is -13.3 °C. The reported value is -8°C[2, 3]. Concerning the variables in instruments, heating rate and thermal history, the obtained result shows good agreement.

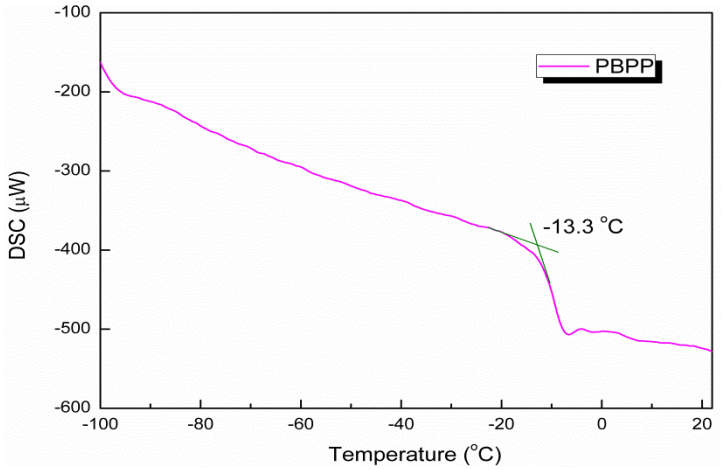

Fig. S2 Differential scanning calorimetric analysis for poly [bis (phenoxy) phosphazene]

3. FTIR-ATR of poly [bis (phenoxy) phosphazene]

Fourier transformed infrared spectra in combination with attenuated total reflectance technique (FTIR-ATR) were recorded using a Nicolet IR 560 spectrometer with horizontal ATR accessory equipped with a ZnSe crystal. The spectra of the samples were recorded in the range of 400-4000 cm^{-1} with a resolution of 4 cm^{-1}. Each spectrum of the membranes was collected 32 times to ensure accuracy. The principle infrared bands for PBPP were listed as follows (in cm^{-1}):3058.60, 1486.22 (C=C-H); 1589.08(aryl); 1238.37(P=N); 1149.39, 914.04(P-O-C); 748.56(P-N). The obtained

result is in good accordance with literature[2].

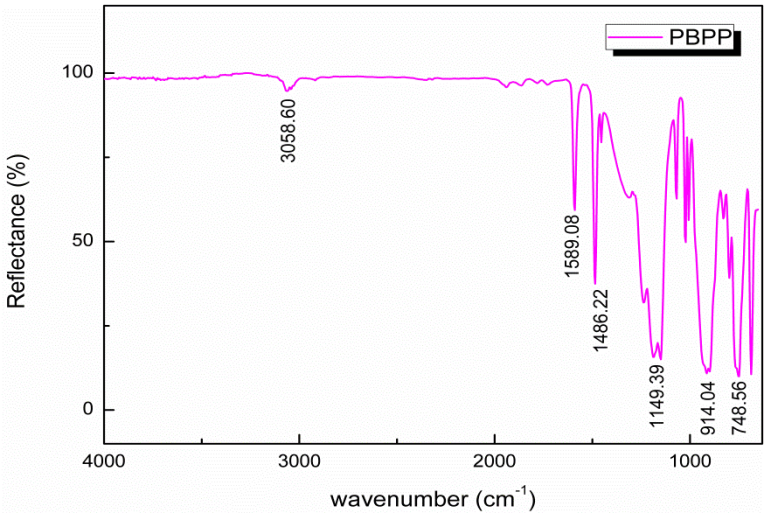

Fig. S3 FTIR-ATR spectrum of poly [bis (phenoxy) phosphazene]

References for Supplementary Information:

1. H. R. Allcock, C. J. Nelson, W. D. Coggio, I. Manners, W. J. Koros, D. R. B. Walker and L. A. Pessan, *Macromolecules*, 1993, 26, 1493-1502.
2. H. R. Allcock, R. L. Kugel and K. J. Valan, *Inorg. Chem.*, 1966, 5, 1709-1715.
3. H. R. Allcock and R. L. Kugel, *J. Am. Chem. Soc.*, 1965, 87, 4216-4217.