Supporting Information:

An efficient synthesis of high-performance anion exchange membranes by applying clickable tetrakis(dialkylamino)phosphonium cations

Characterization results

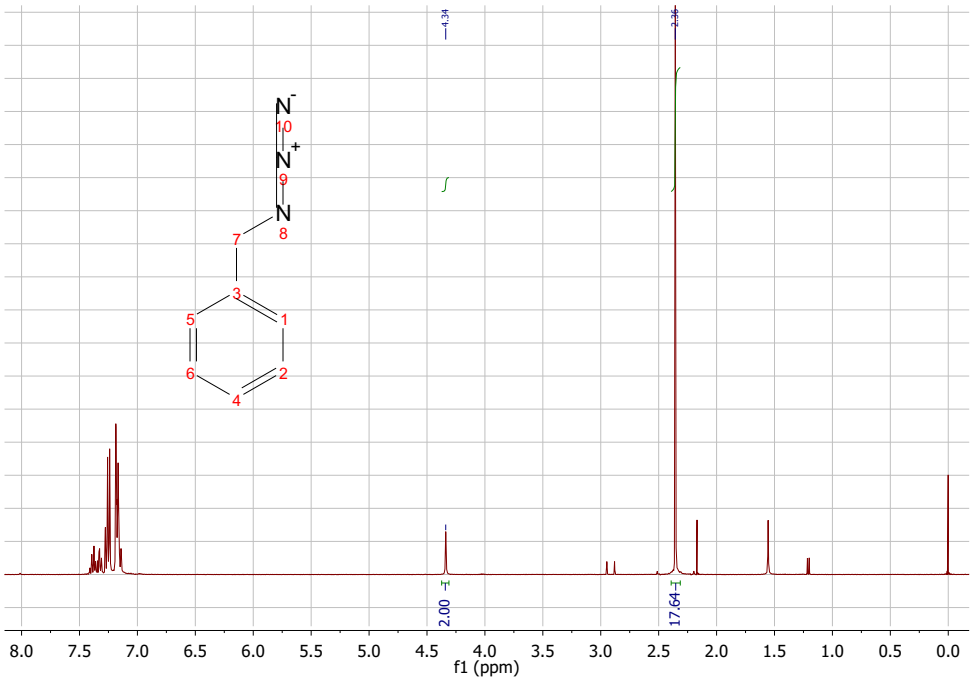


Figure S1: ^{1}H NMR (400 MHz, $CDCl_3$) spectra of benzyl azide solution in toluene.

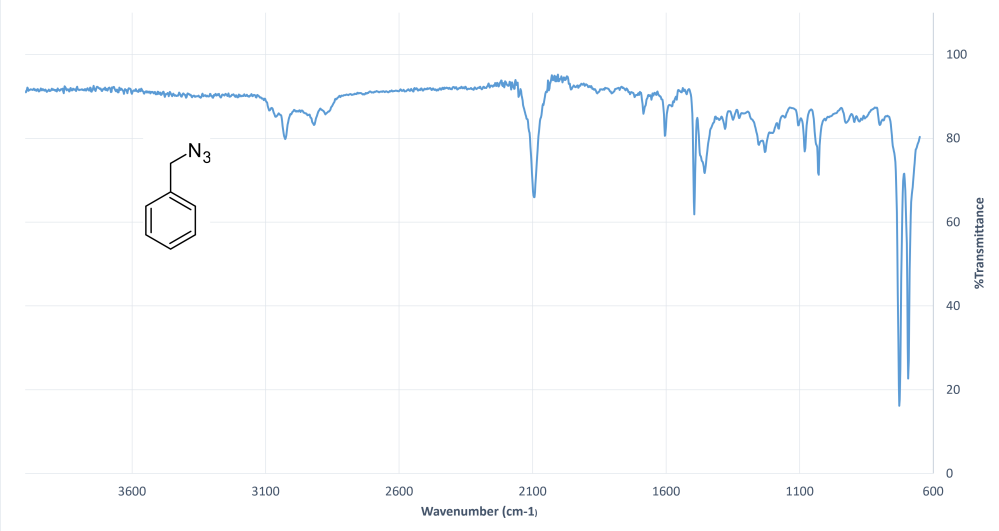


Figure S2: FTIR spectra of benzyl azide solution in toluene.

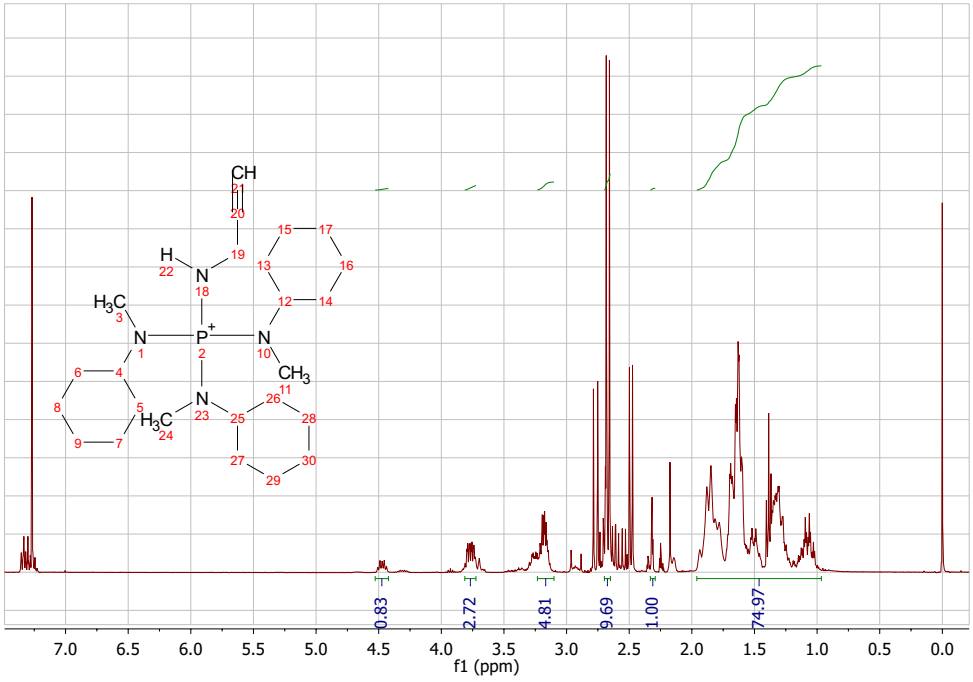


Figure S3: ^{1}H NMR (400 MHz, $CDCl_3$) spectra of compound **1'**.

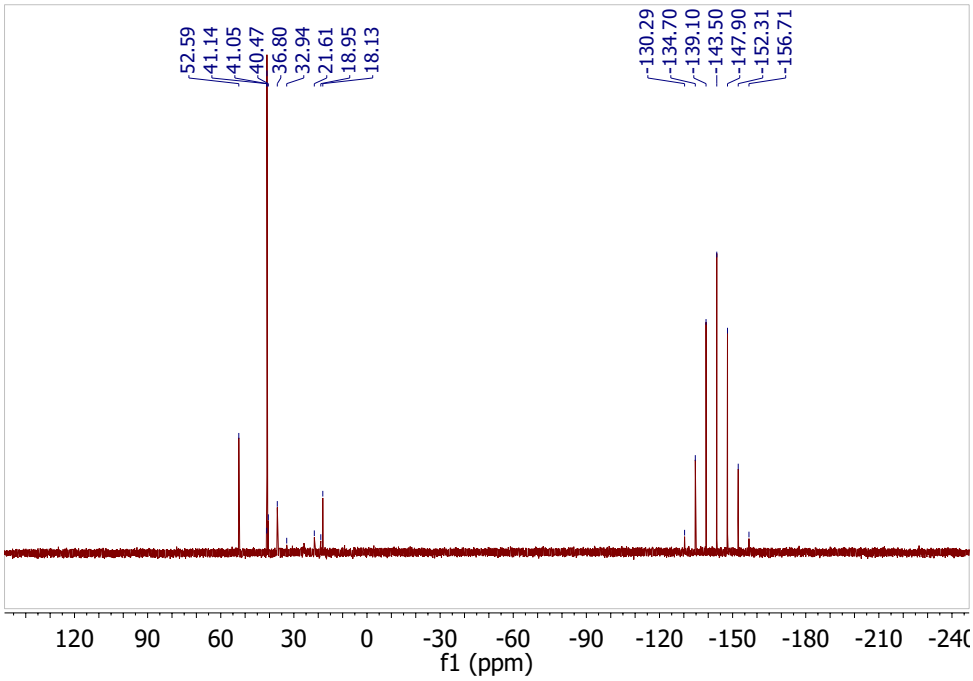


Figure S4: ^{31}P NMR (162 MHz, $CDCl_3$) spectra of compound **1'**.

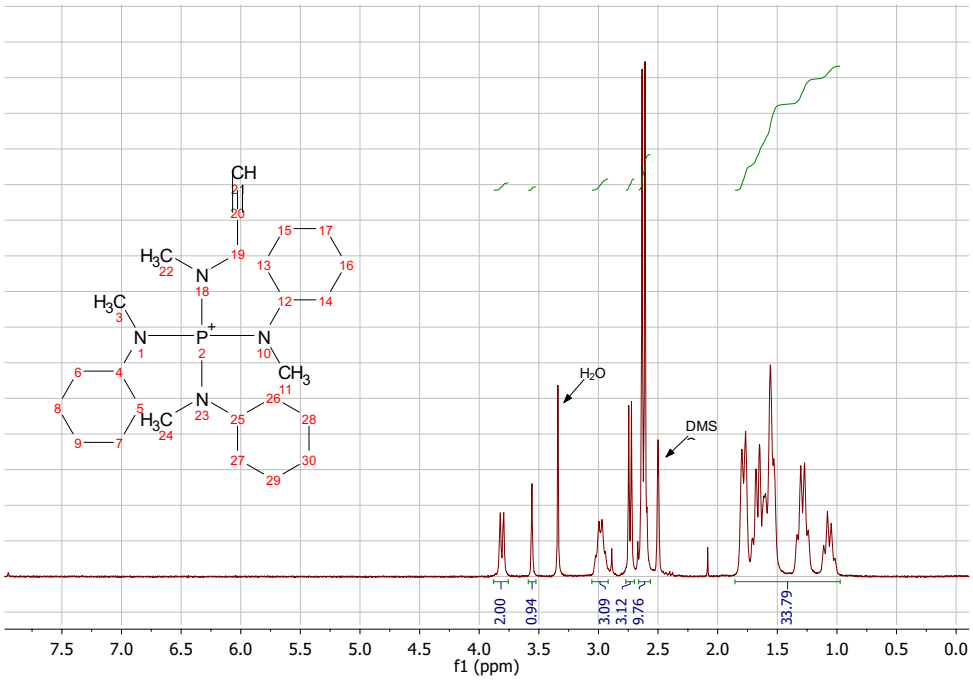


Figure S5: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **1**.

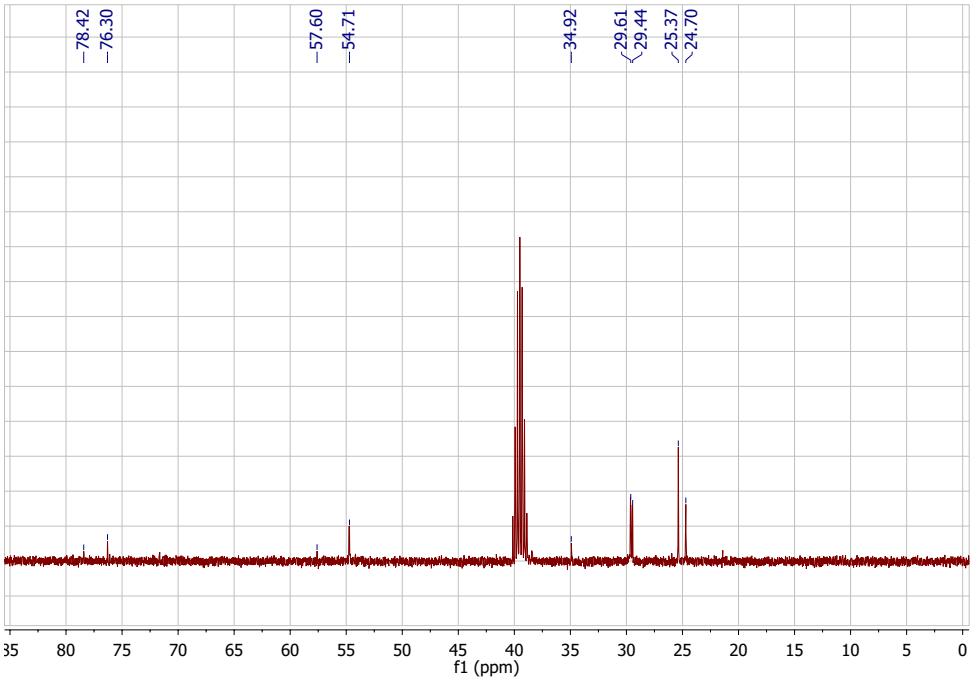


Figure S6: ^{13}C NMR (101 MHz, DMSO-d_6) spectra of compound **1**.

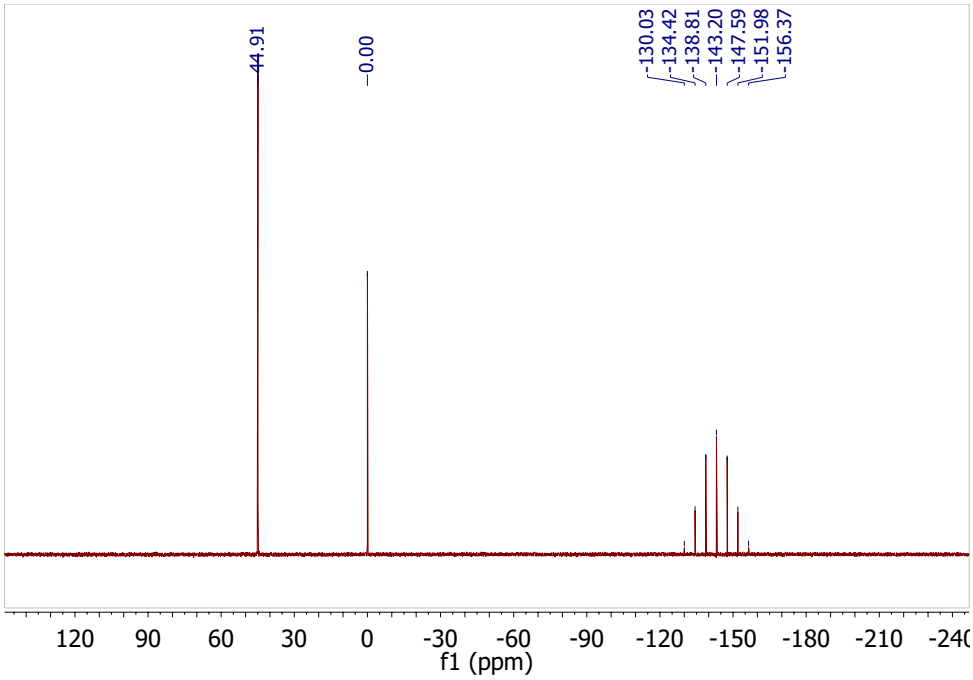


Figure S7: ^{31}P NMR (162 MHz, DMSO-d_6) spectra of compound **1**.

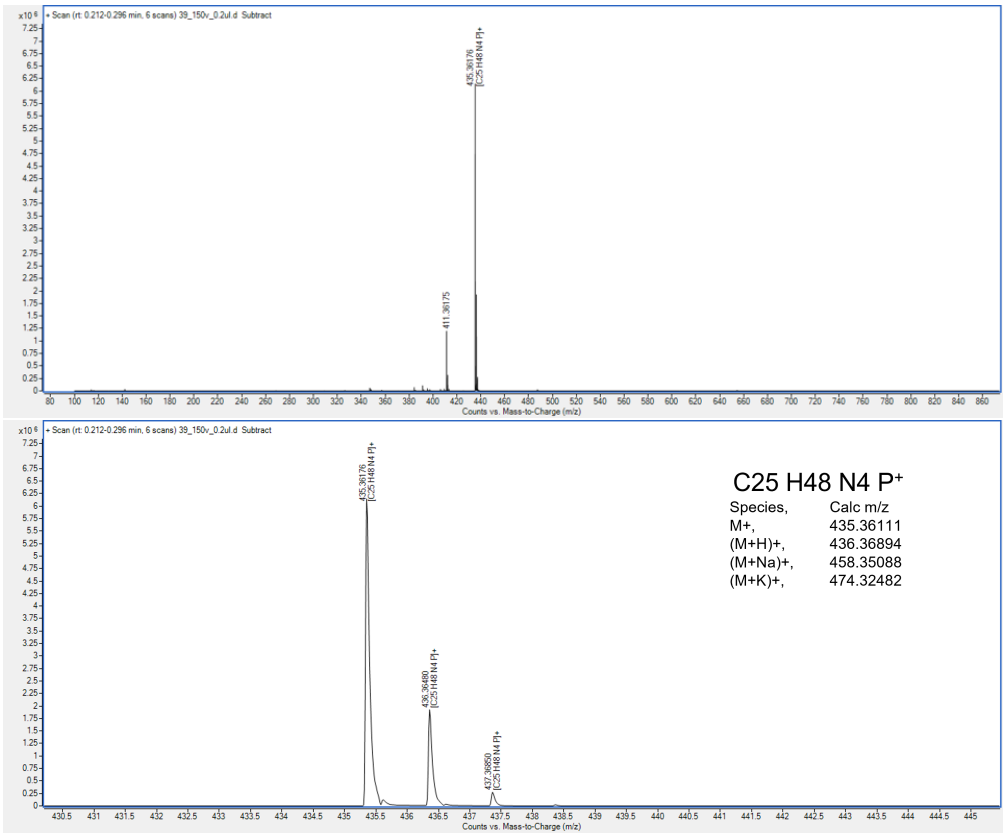


Figure S8: MS spectra of compound **1**.

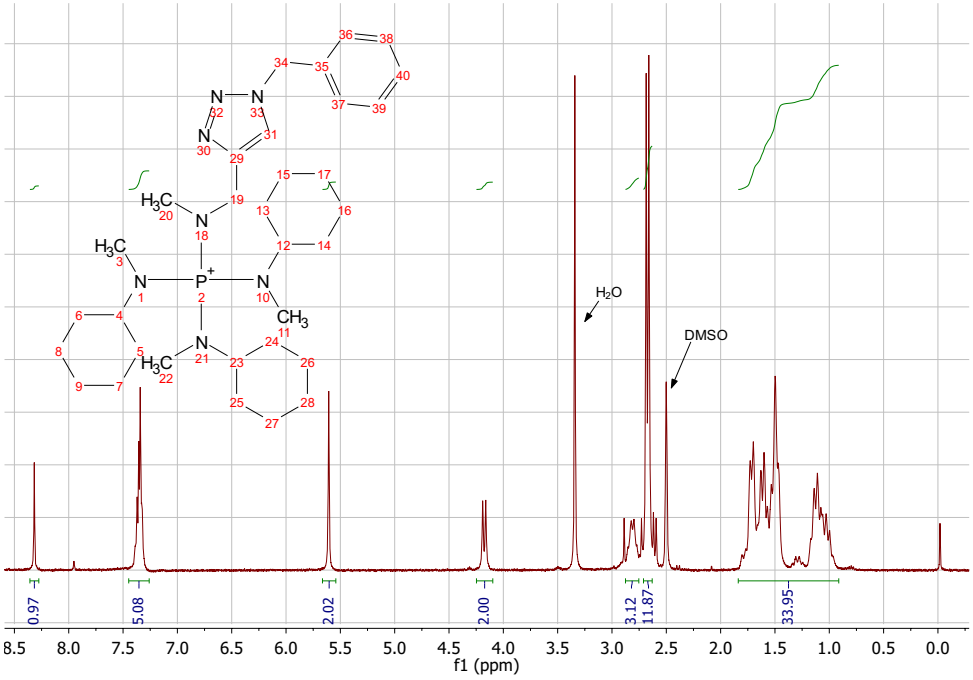


Figure S9: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **1a**.

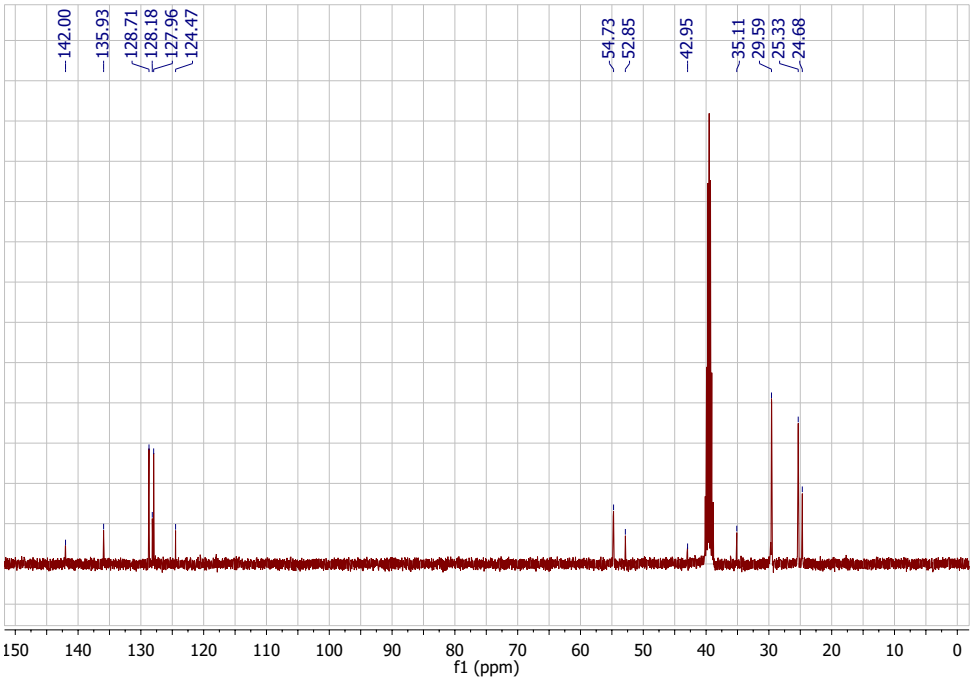


Figure S10: ^{13}C NMR (101 MHz, DMSO-d_6) spectra of compound **1a**.

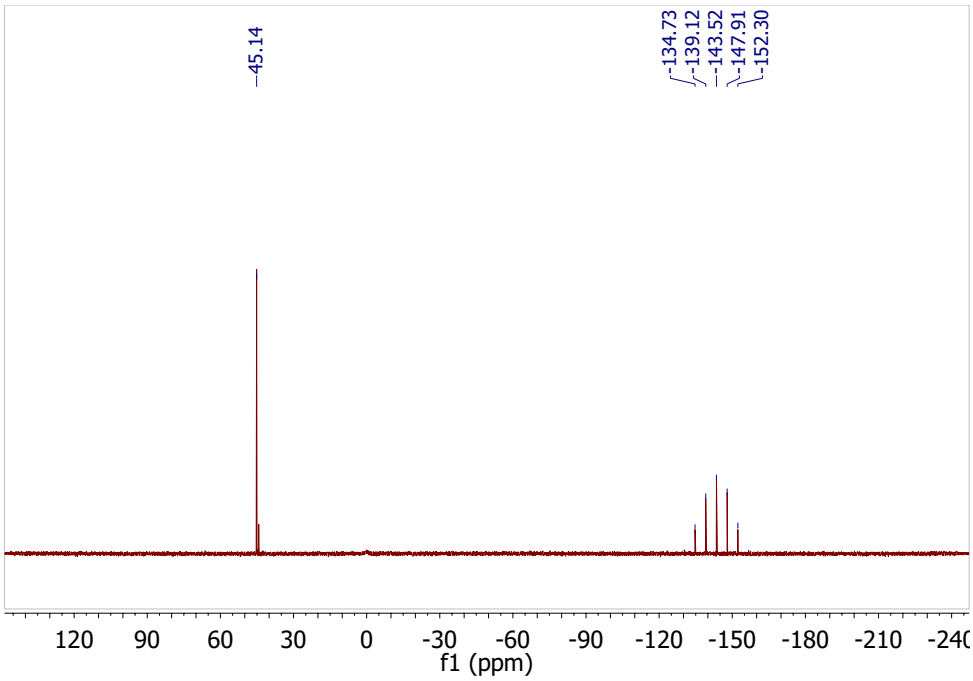


Figure S11: ^{31}P NMR (162 MHz, DMSO-d_6) spectra of compound **1a**.

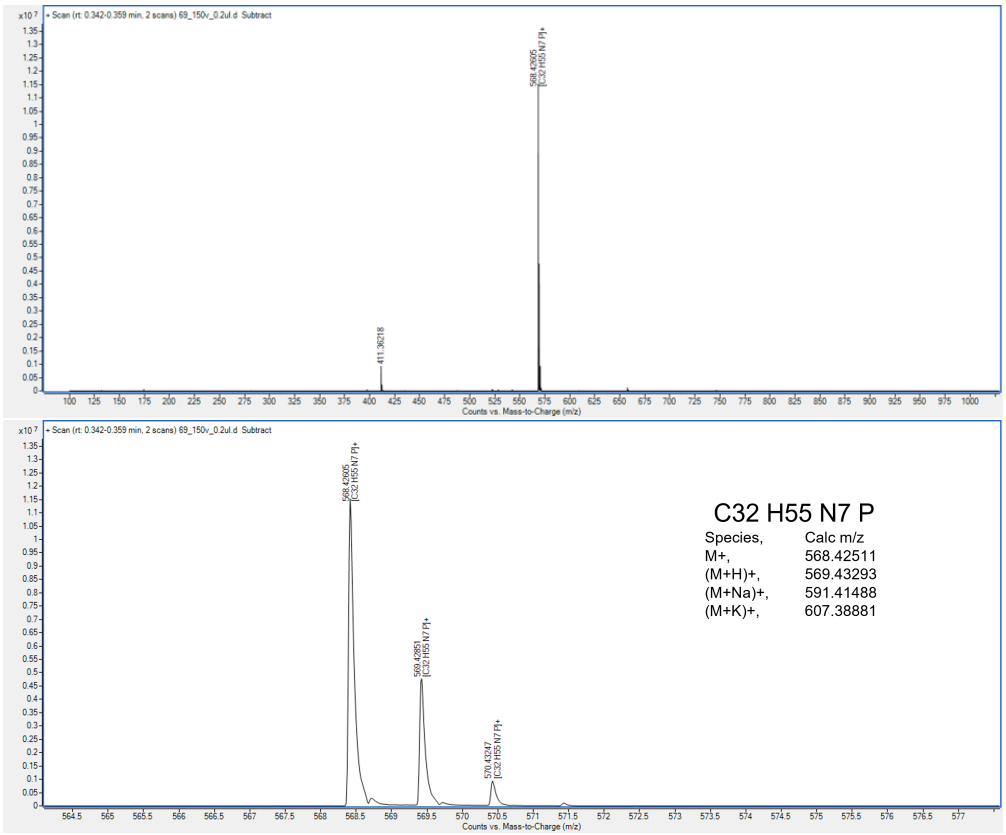


Figure S12: MS spectra of compound **1a**.

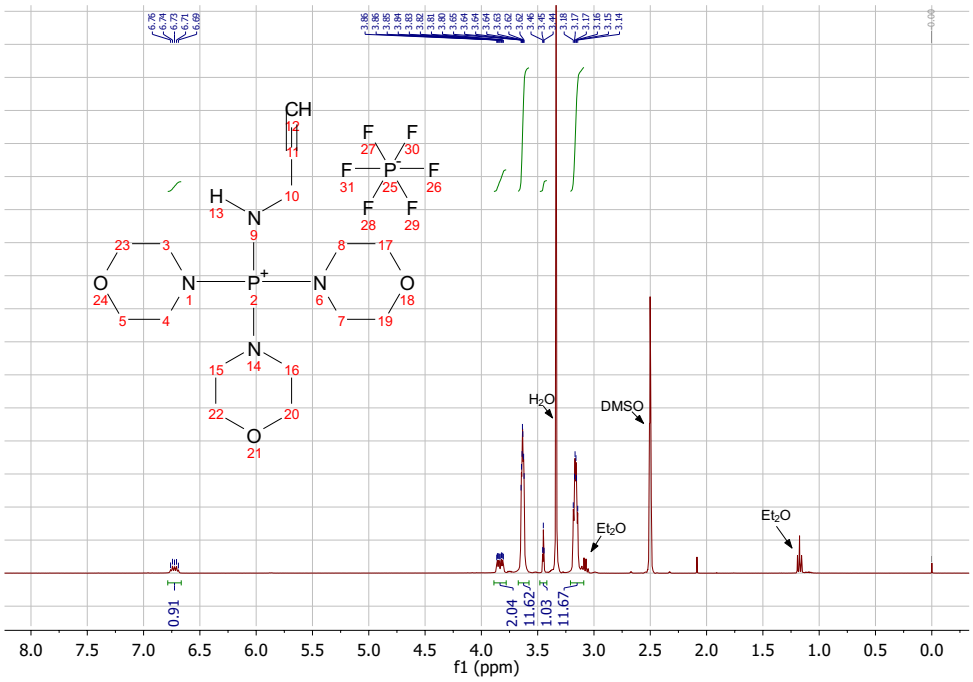


Figure S13: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **2'**.

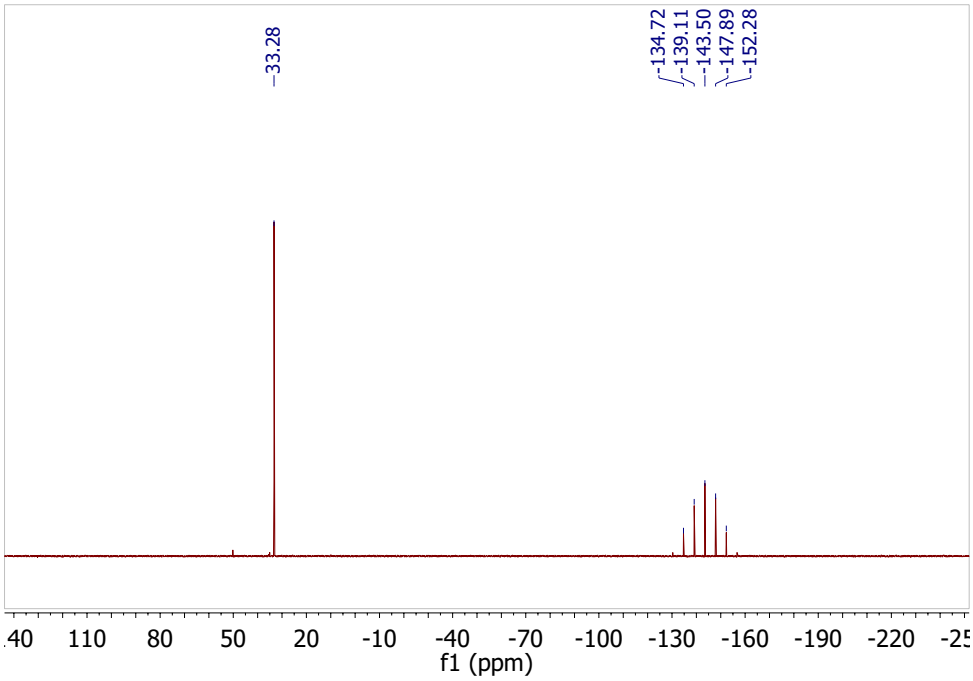


Figure S14: ^{31}P NMR (162 MHz, DMSO-d_6) spectra of compound **2'**.

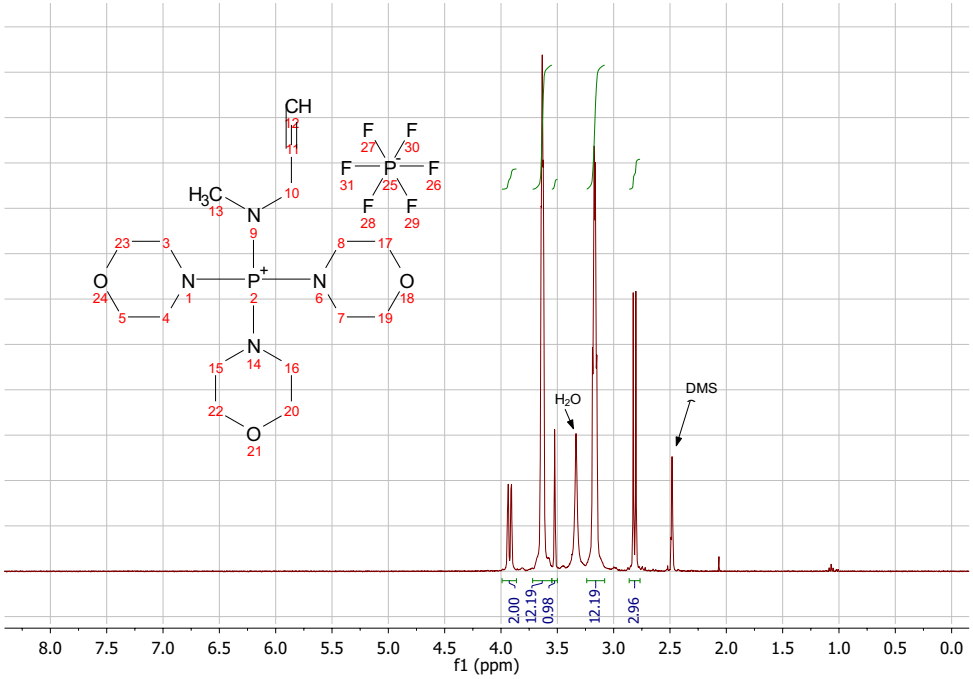


Figure S15: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **2**.

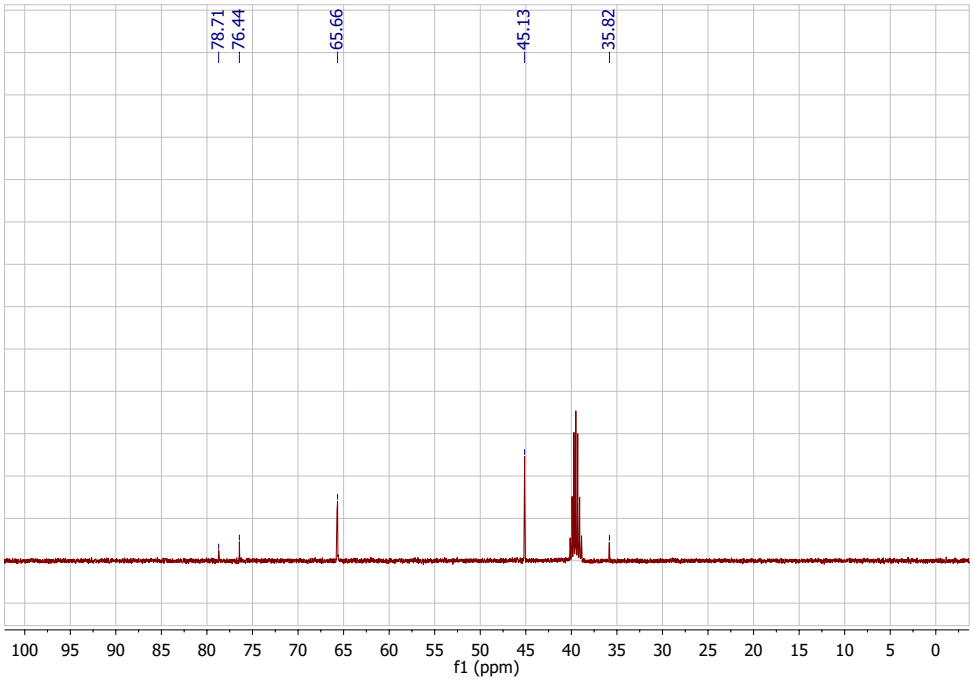


Figure S16: ^{13}C NMR (101 MHz, DMSO-d_6) spectra of compound **2**.

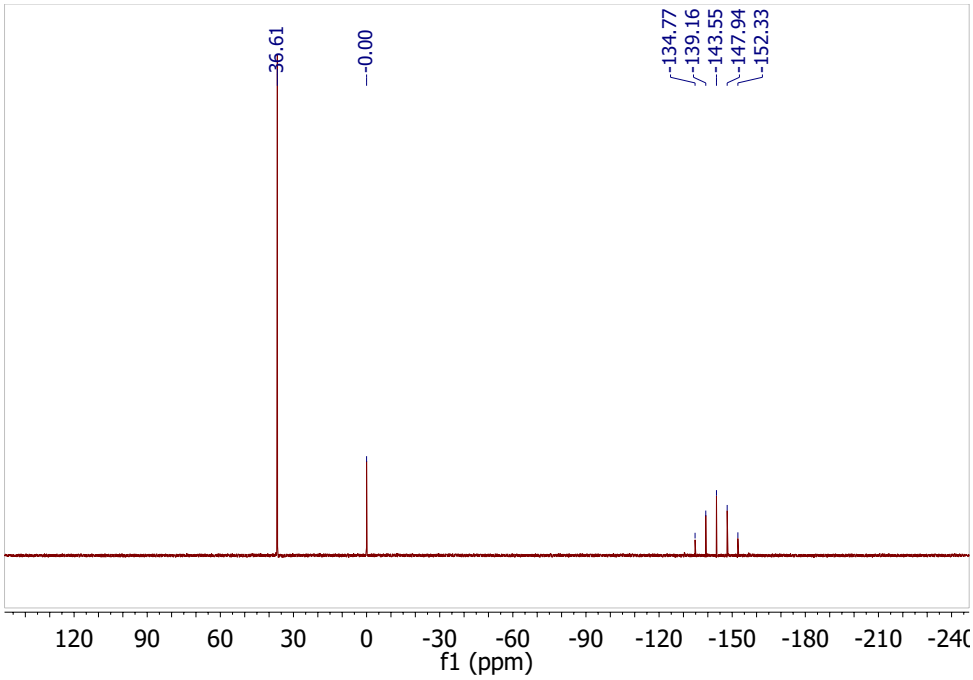


Figure S17: ^{31}P NMR (162 MHz, DMSO-d_6) spectra of compound **2**.

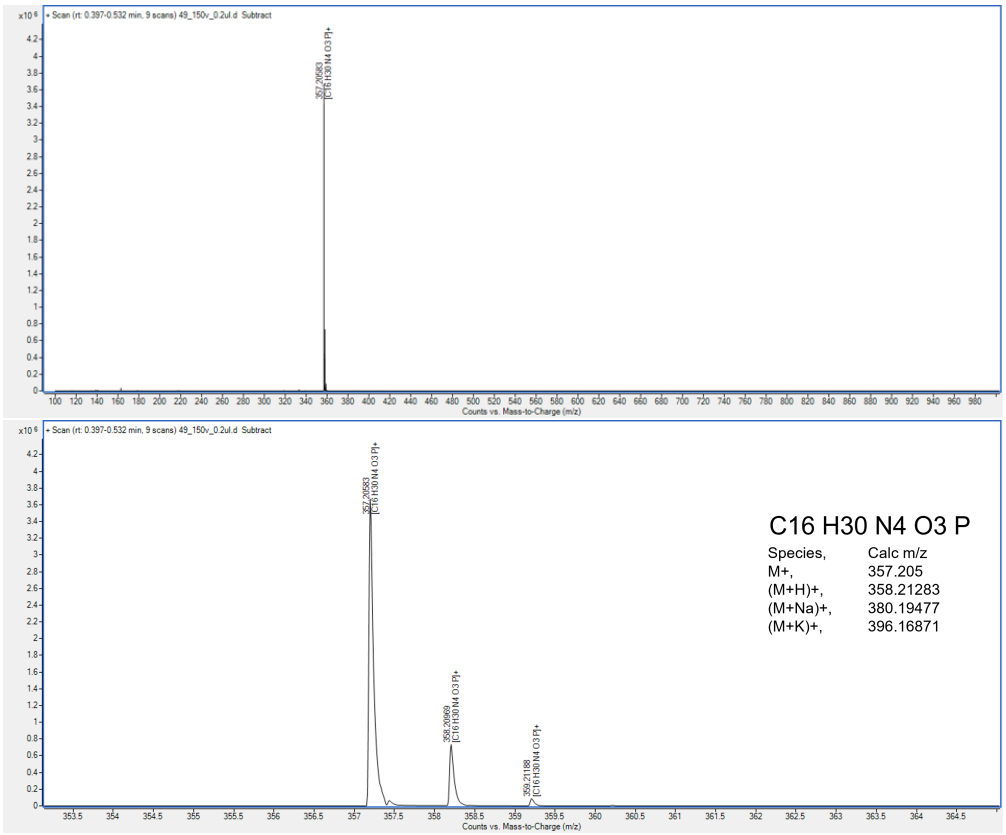


Figure S18: MS spectra of compound **2**.

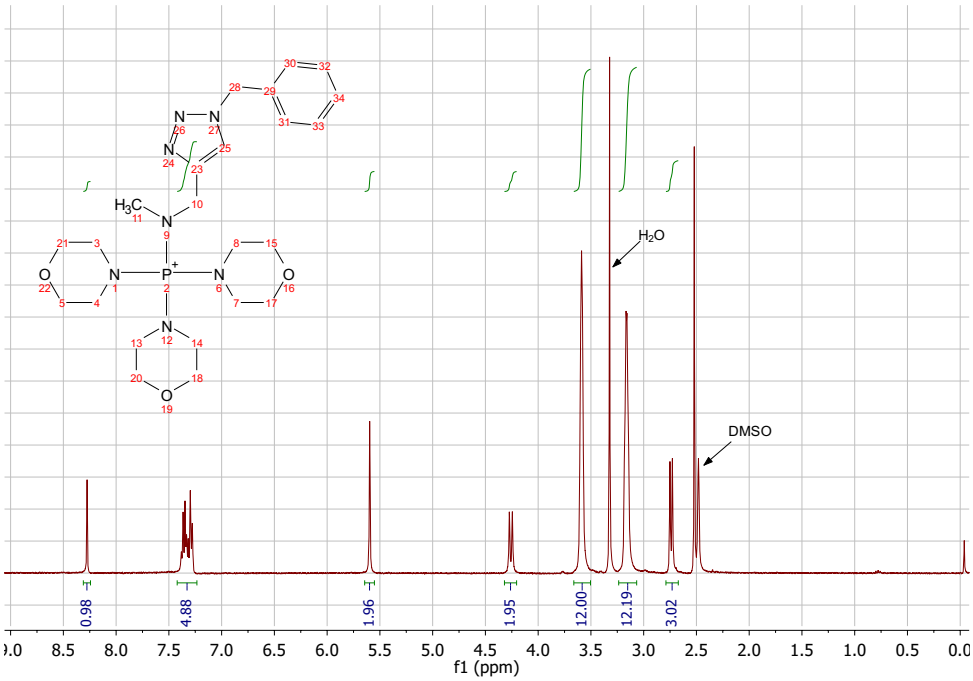


Figure S19: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **2a**.

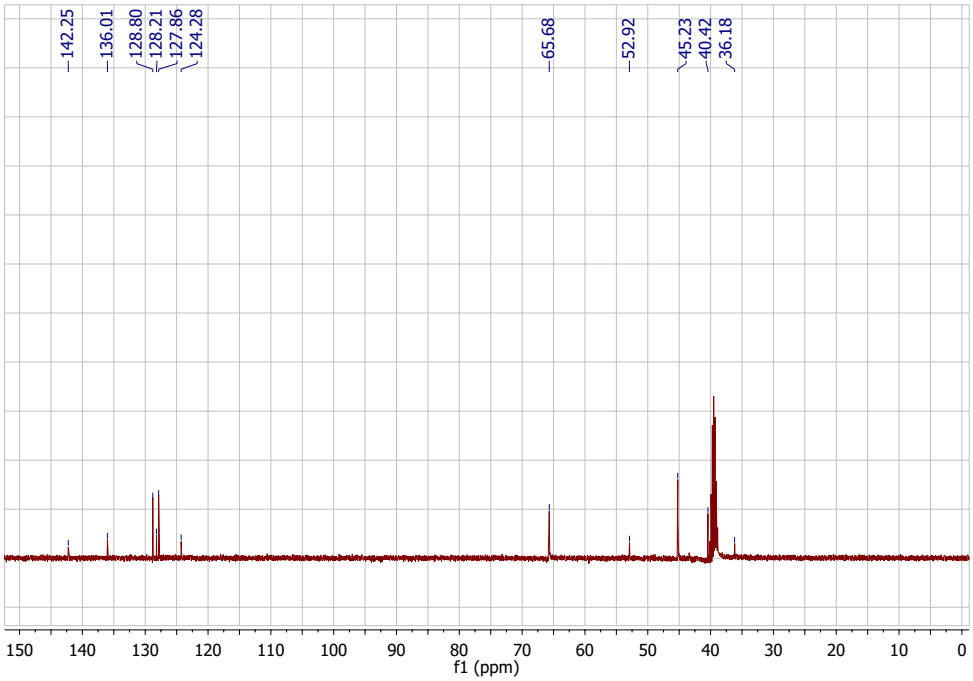


Figure S20: ^{13}C NMR (101 MHz, DMSO-d_6) spectra of compound **2a**.

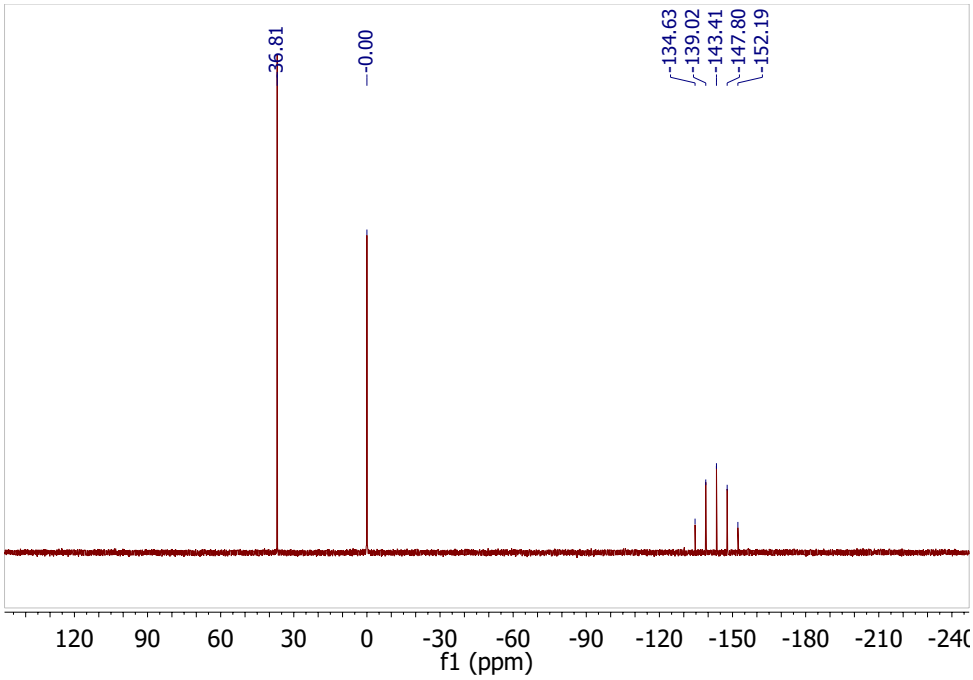


Figure S21: ^{31}P NMR (162 MHz, DMSO-d_6) spectra of compound **2a**.

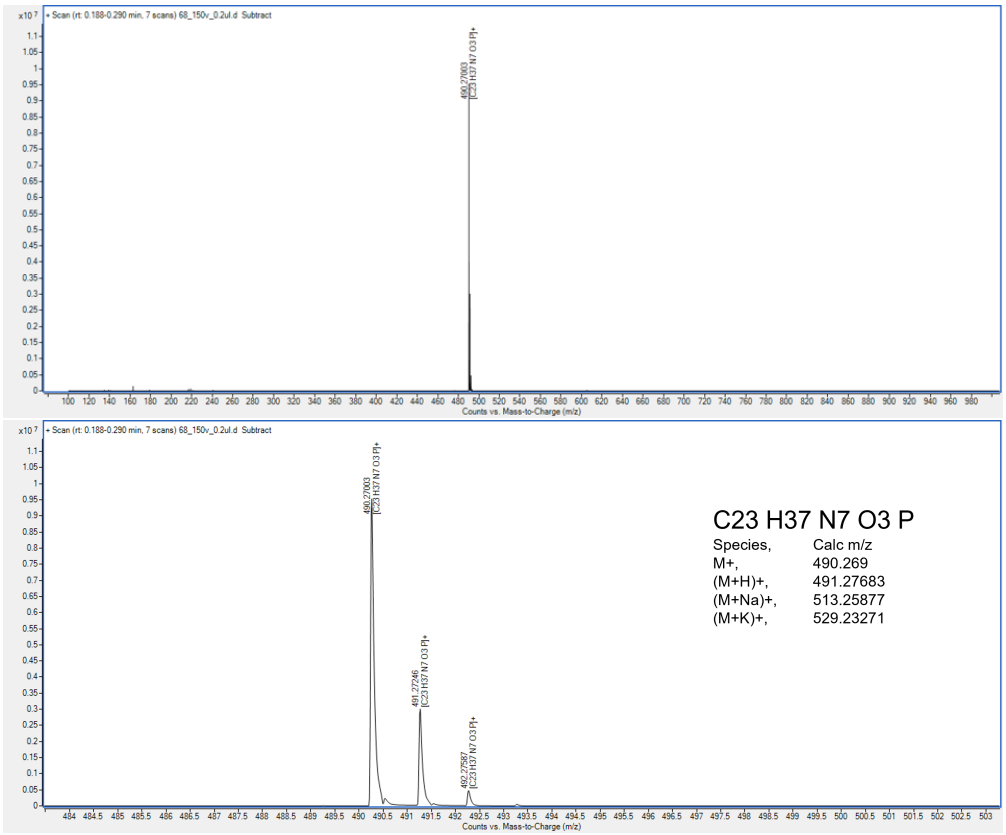


Figure S22: MS spectra of compound **2a**.

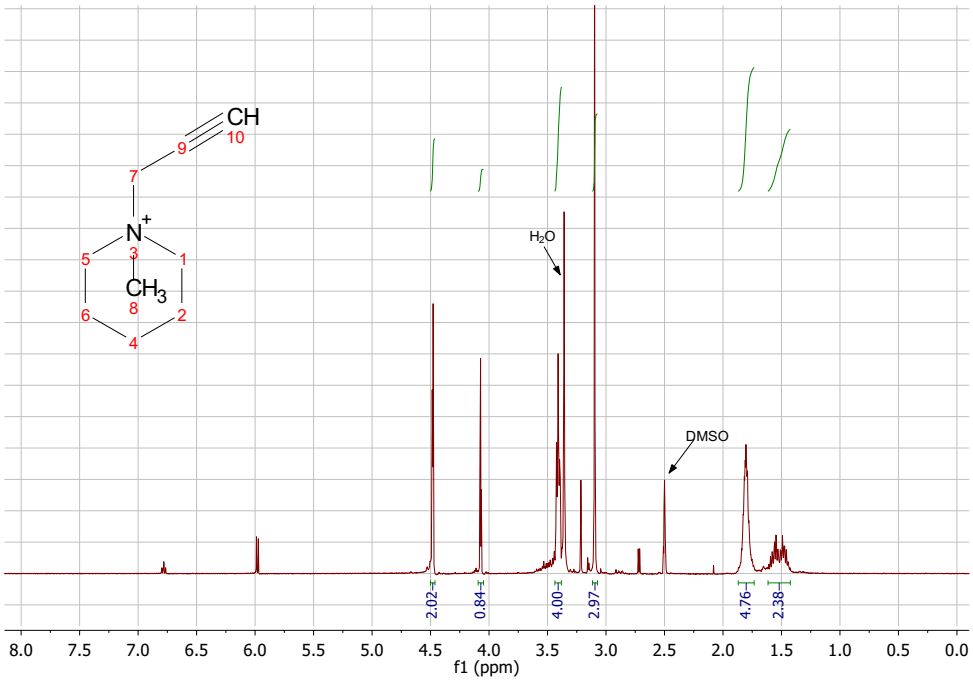


Figure S23: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **3**.

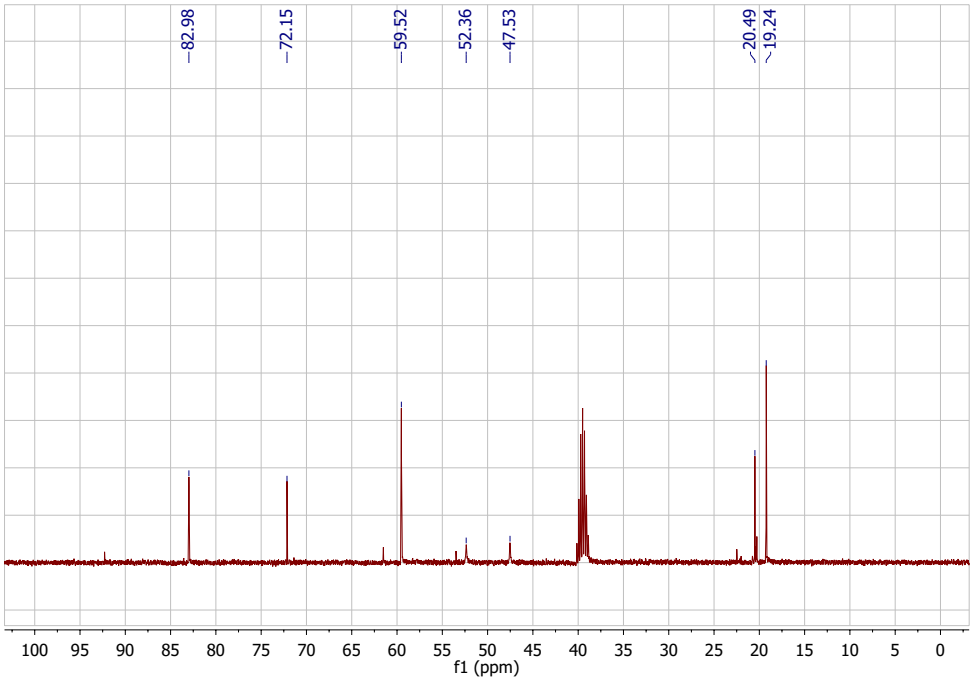


Figure S24: ^{13}C NMR (101 MHz, DMSO-d_6) spectra of compound **3**.

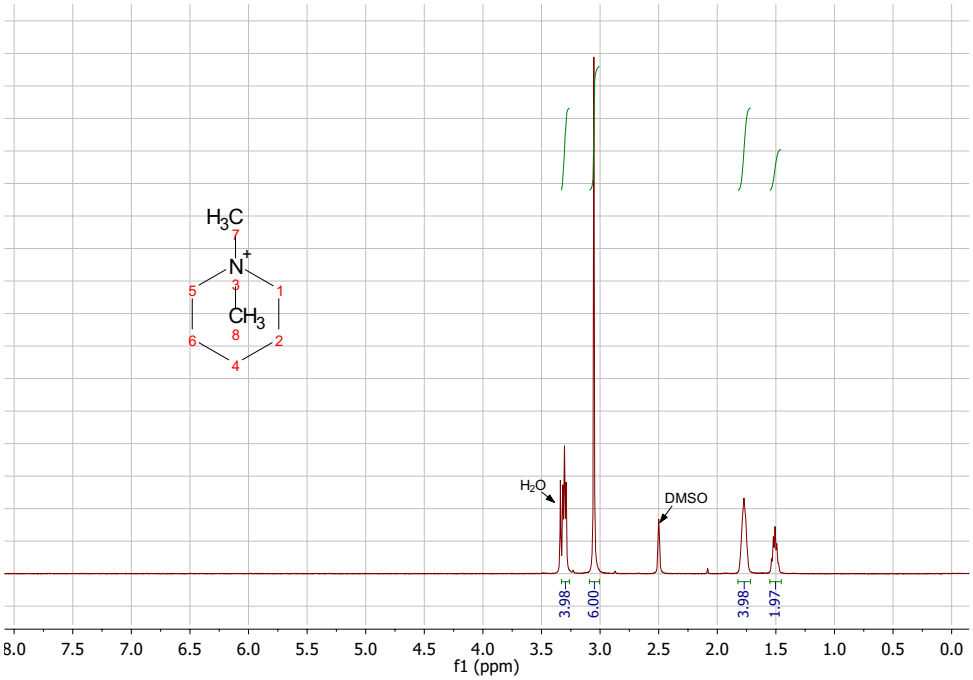


Figure S25: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of compound **3a**.

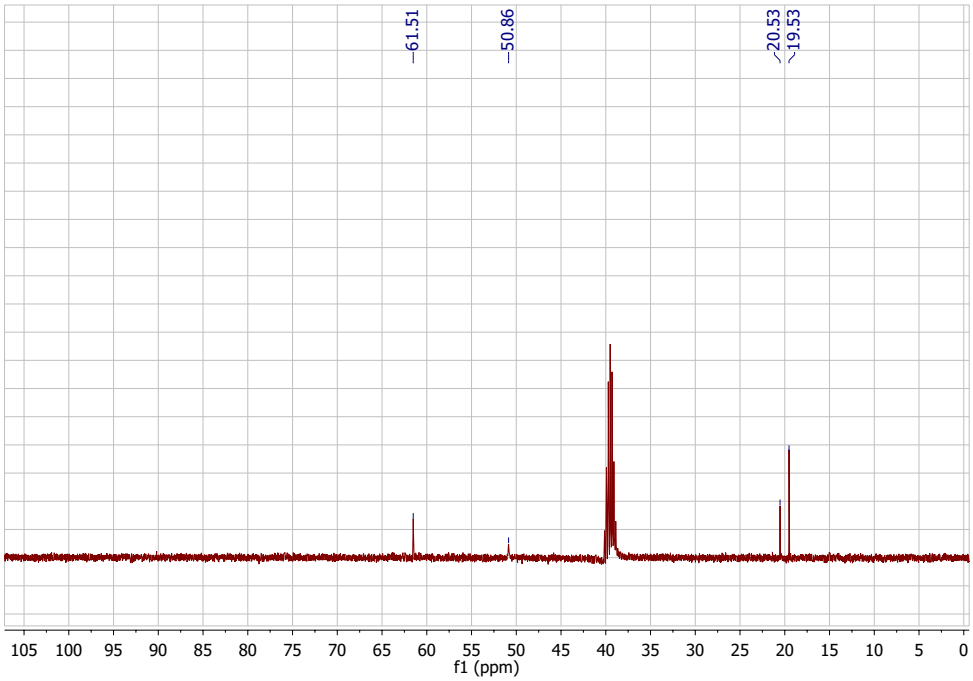


Figure S26: ^{13}C NMR (101 MHz, DMSO-d_6) spectra of compound **3a**.

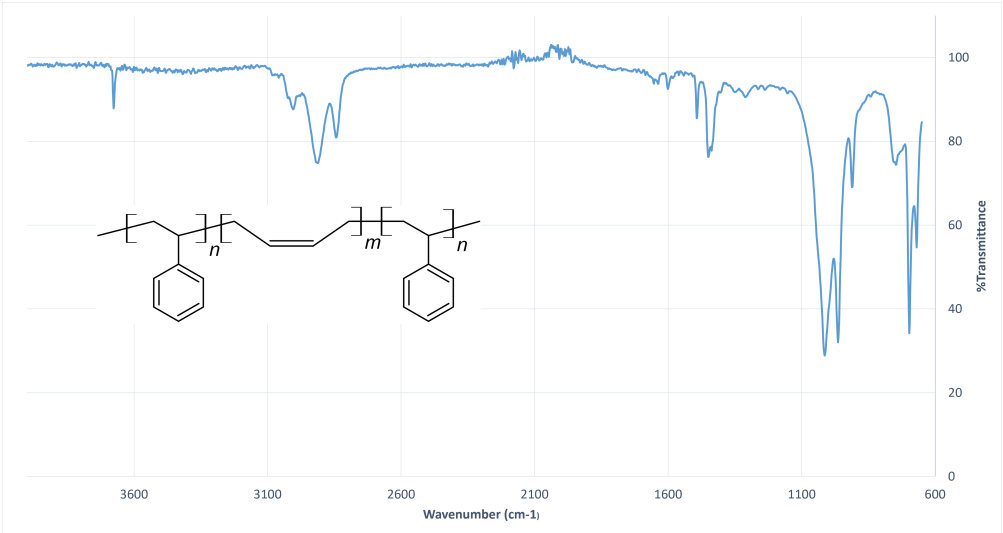


Figure S27: FTIR spectra of SBS.

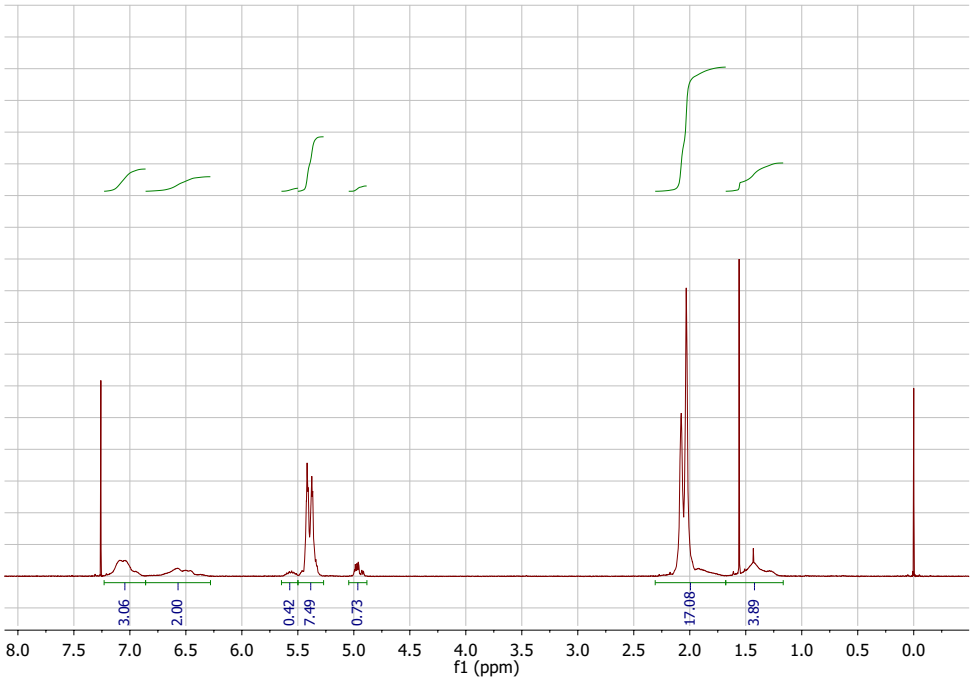


Figure S28: ^{1}H NMR (400 MHz, $CDCl_3$) spectra of SBS.

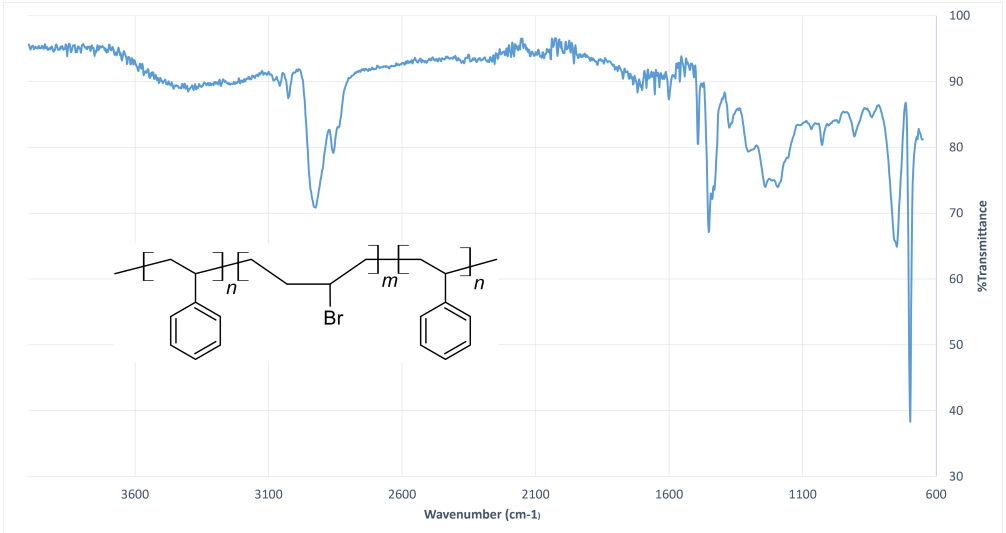


Figure S29: FTIR spectra of SBS-Br.

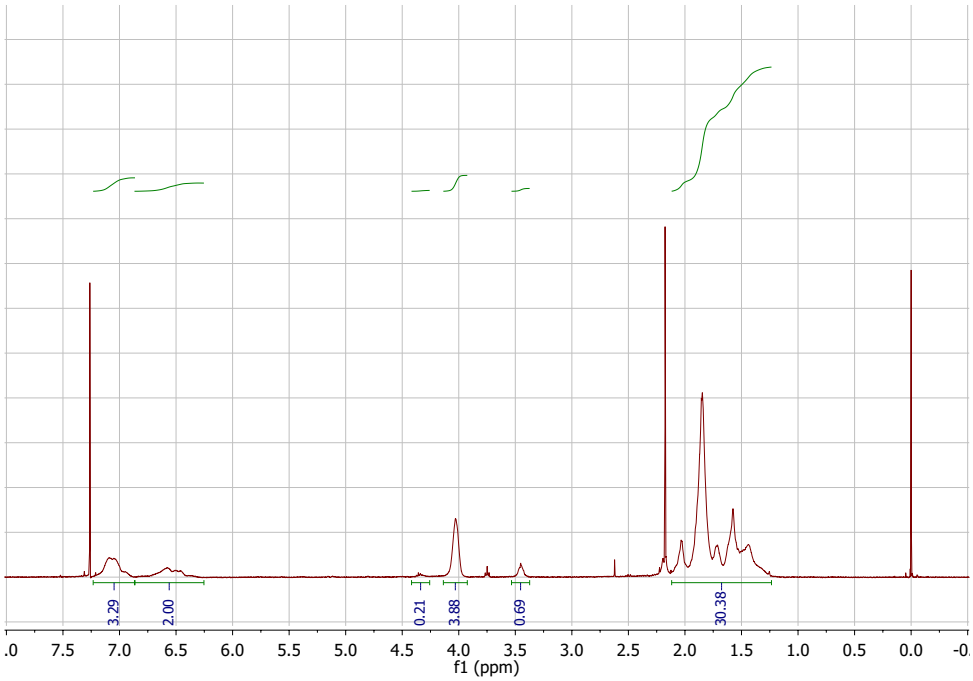


Figure S30: ^{1}H NMR (400 MHz, $CDCl_3$) spectra of SBS-Br.

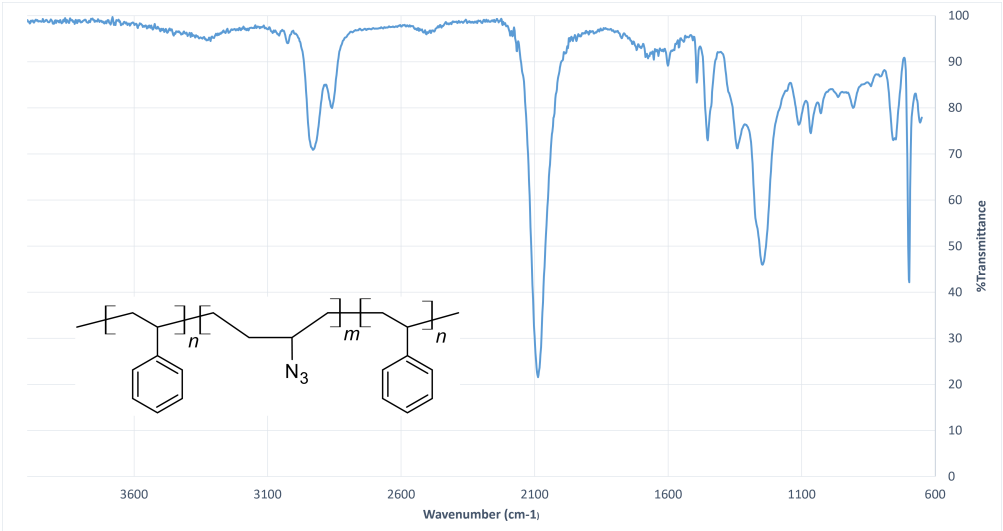


Figure S31: FTIR spectra of SBS-N3.

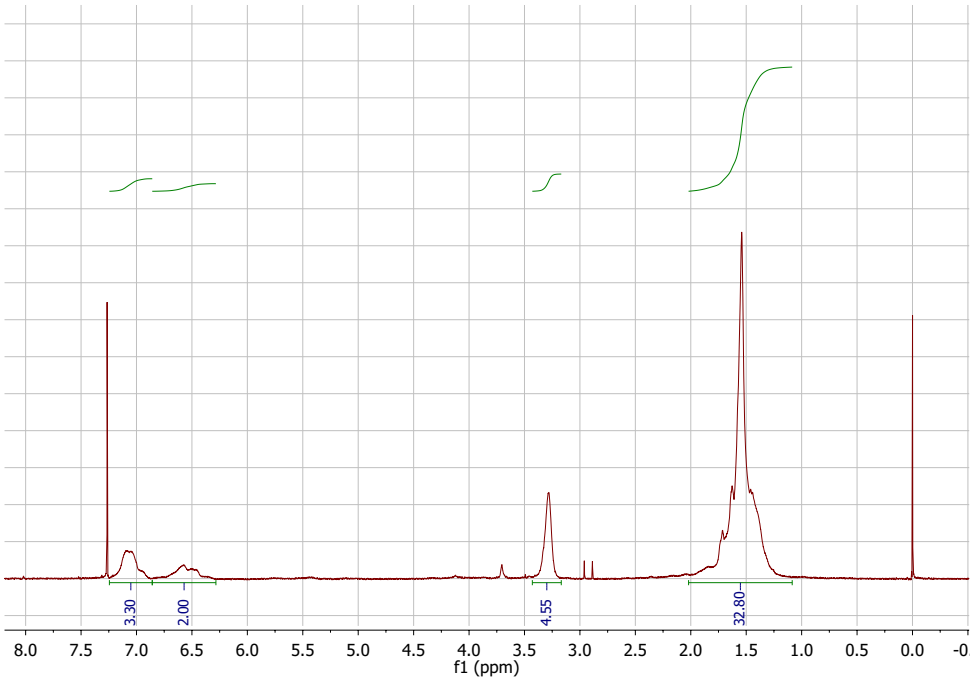


Figure S32: ^{1}H NMR (400 MHz, $CDCl_3$) spectra of SBS-N3.

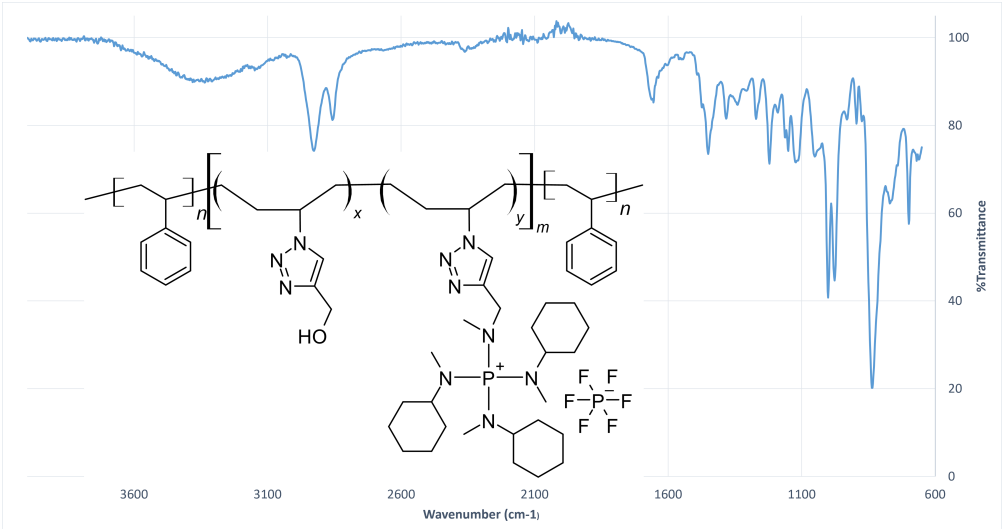


Figure S33: FTIR spectra of polyelectrolyte SBS-c-**1**A.

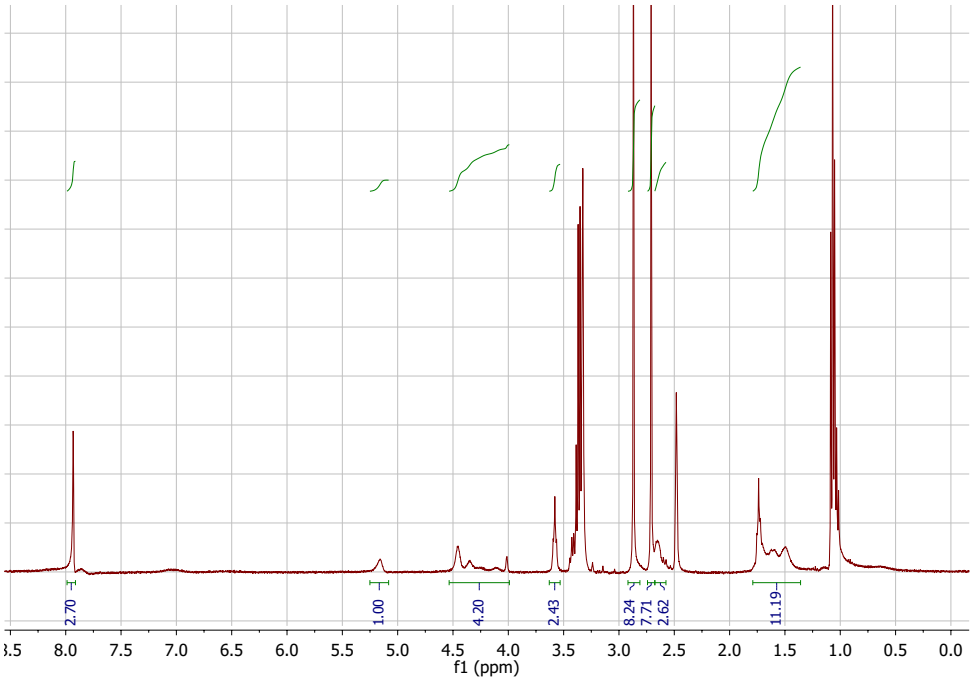


Figure S34: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of polyelectrolyte SBS-c-**1**A.

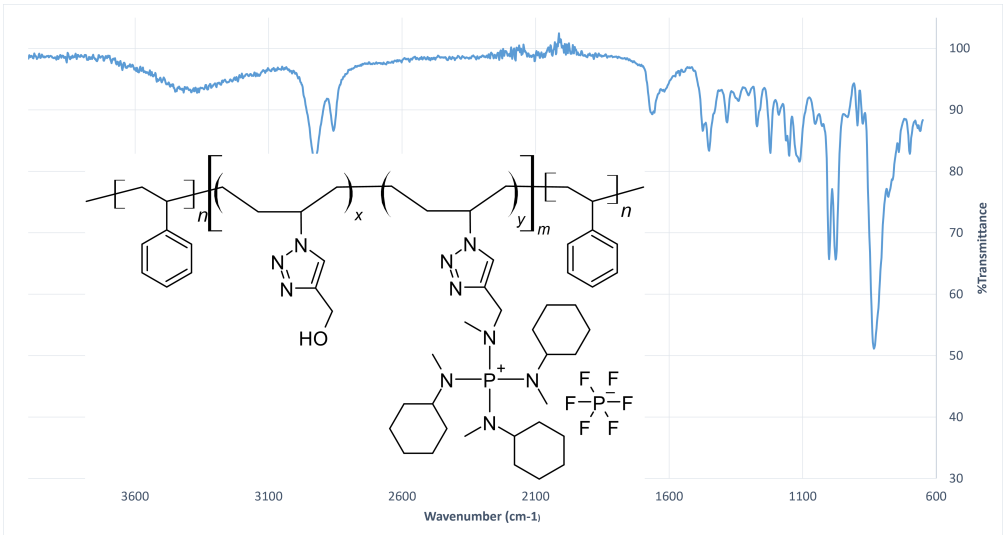


Figure S35: FTIR spectra of polyelectrolyte SBS-c-**1**B.

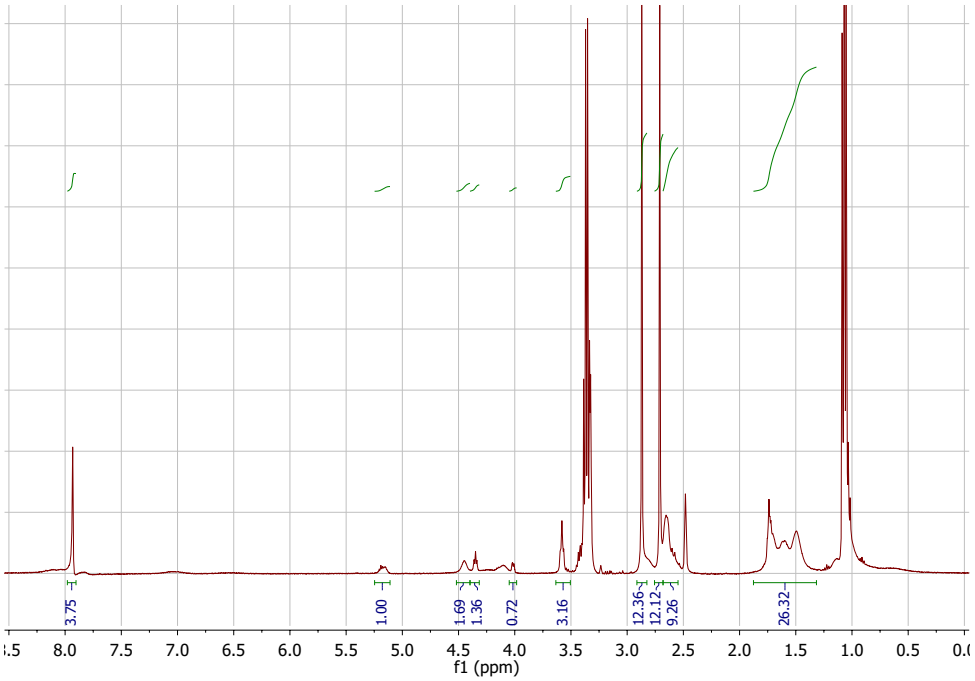


Figure S36: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of polyelectrolyte SBS-c-**1**B.

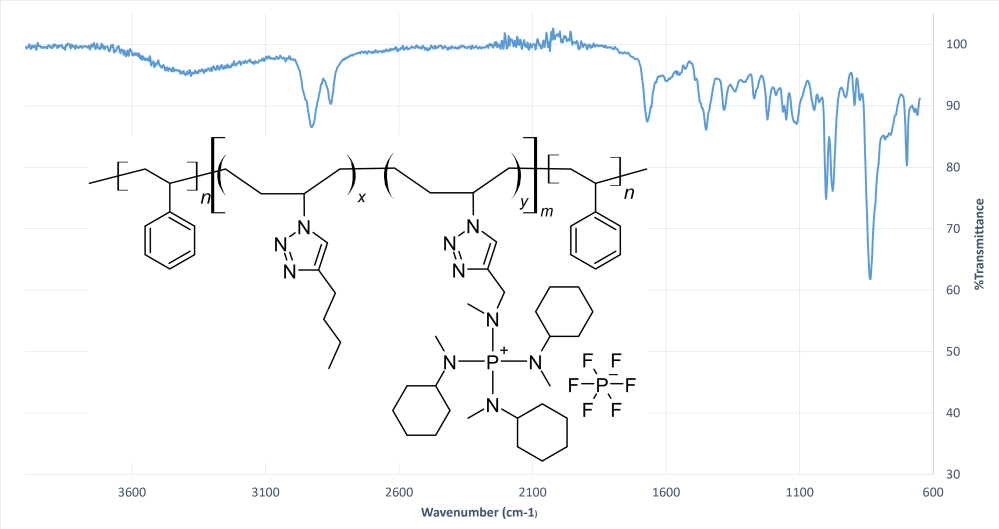


Figure S37: FTIR spectra of polyelectrolyte SBS-c-**1**C.

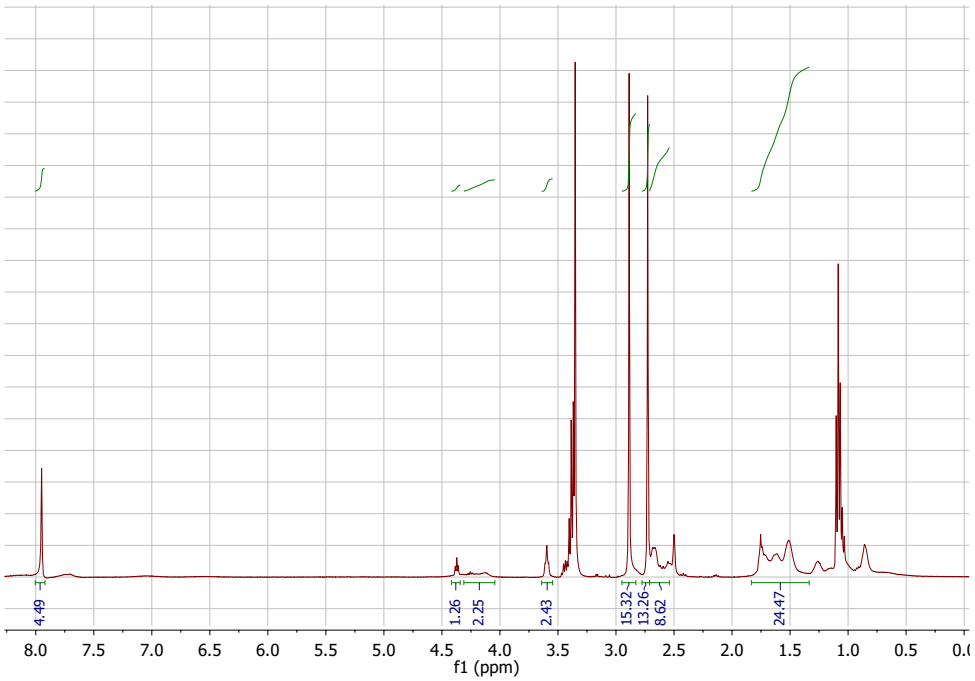


Figure S38: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of polyelectrolyte SBS-c-**1**C.

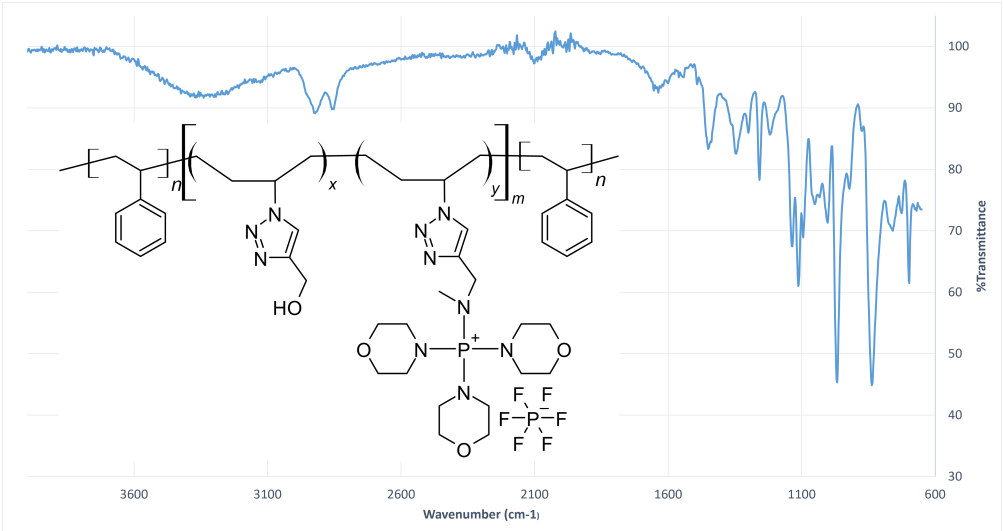


Figure S39: FTIR spectra of polyelectrolyte SBS-c-**2**A.

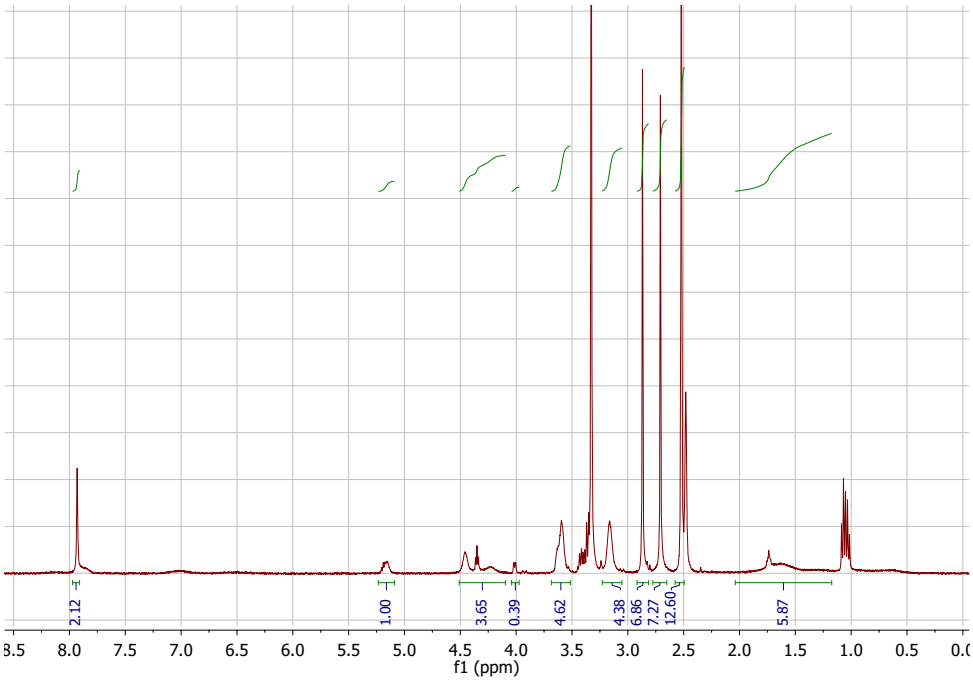


Figure S40: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of polyelectrolyte SBS-c-**2**A.

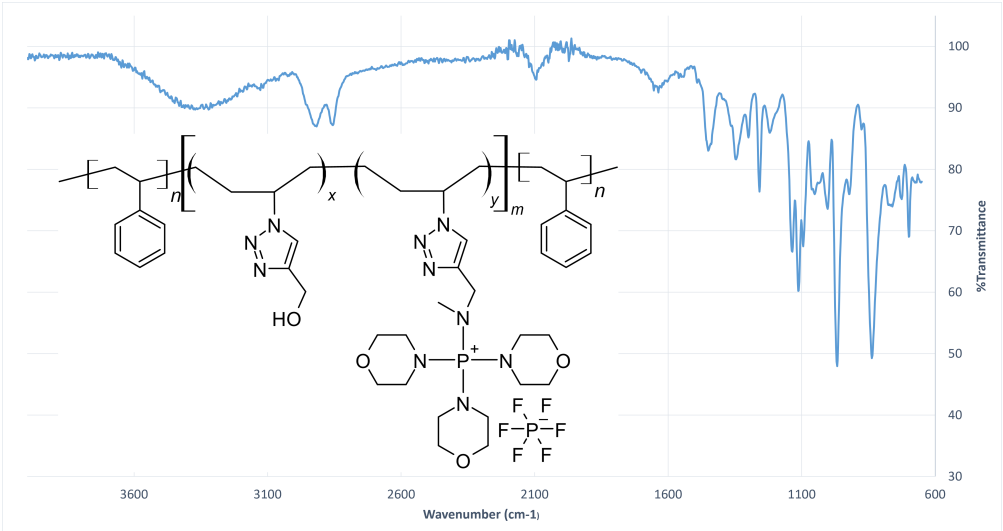


Figure S41: FTIR spectra of polyelectrolyte SBS-c-**2**B.

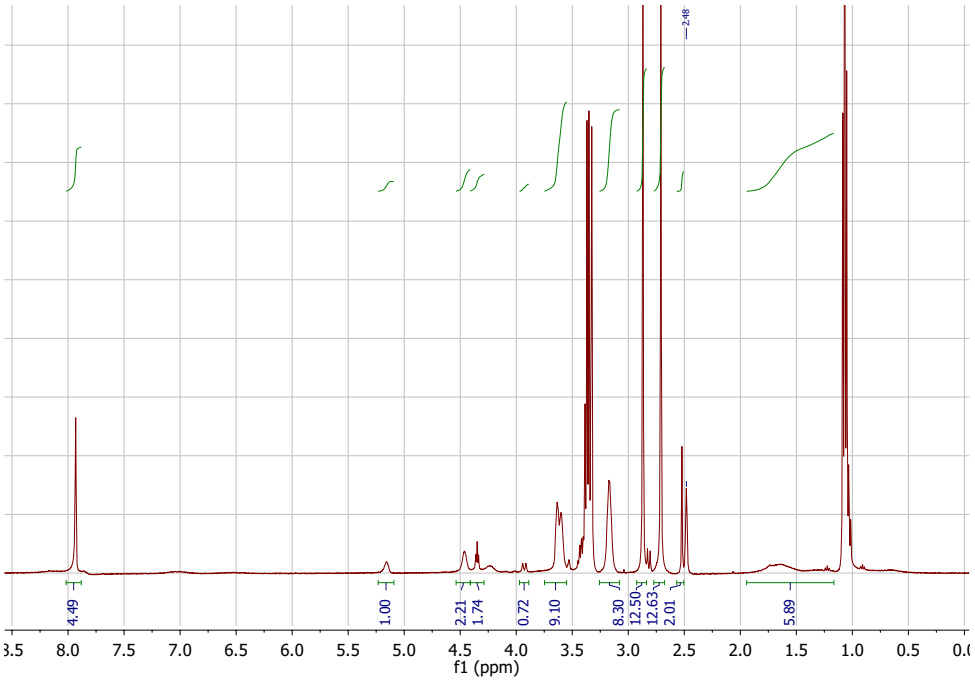


Figure S42: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of polyelectrolyte SBS-c-**2**B.

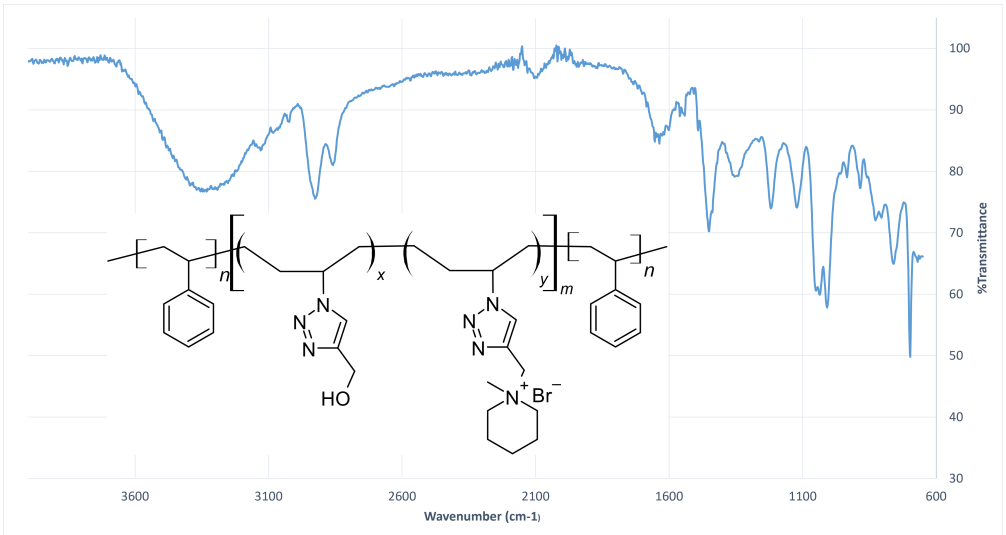


Figure S43: FTIR spectra of polyelectrolyte SBS-c-**3**A.

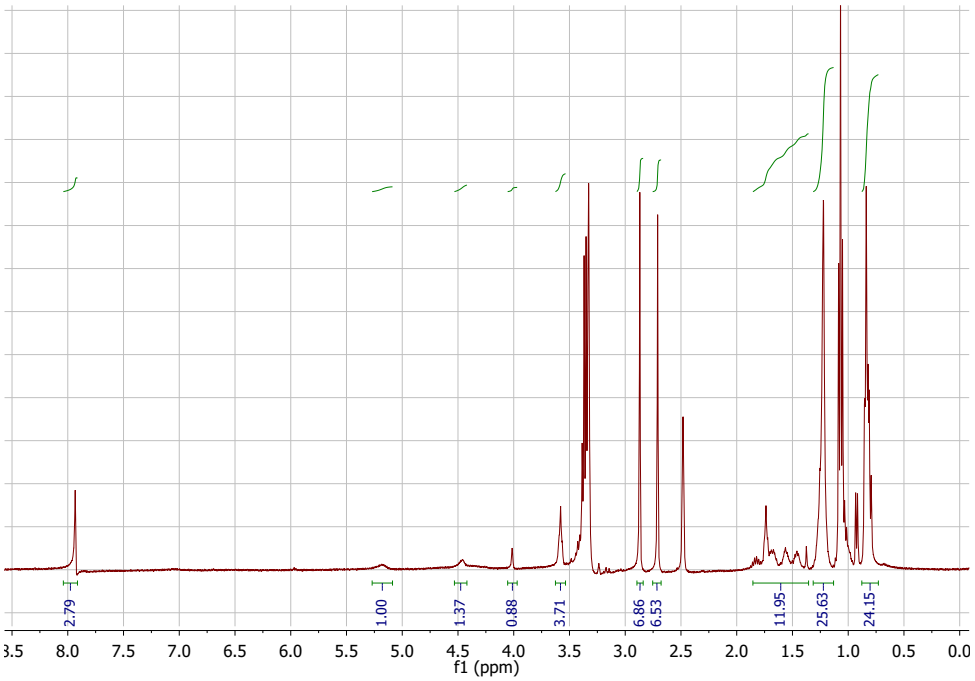


Figure S44: ^{1}H NMR (400 MHz, DMSO-d_6) spectra of polyelectrolyte SBS-c-**3**A.

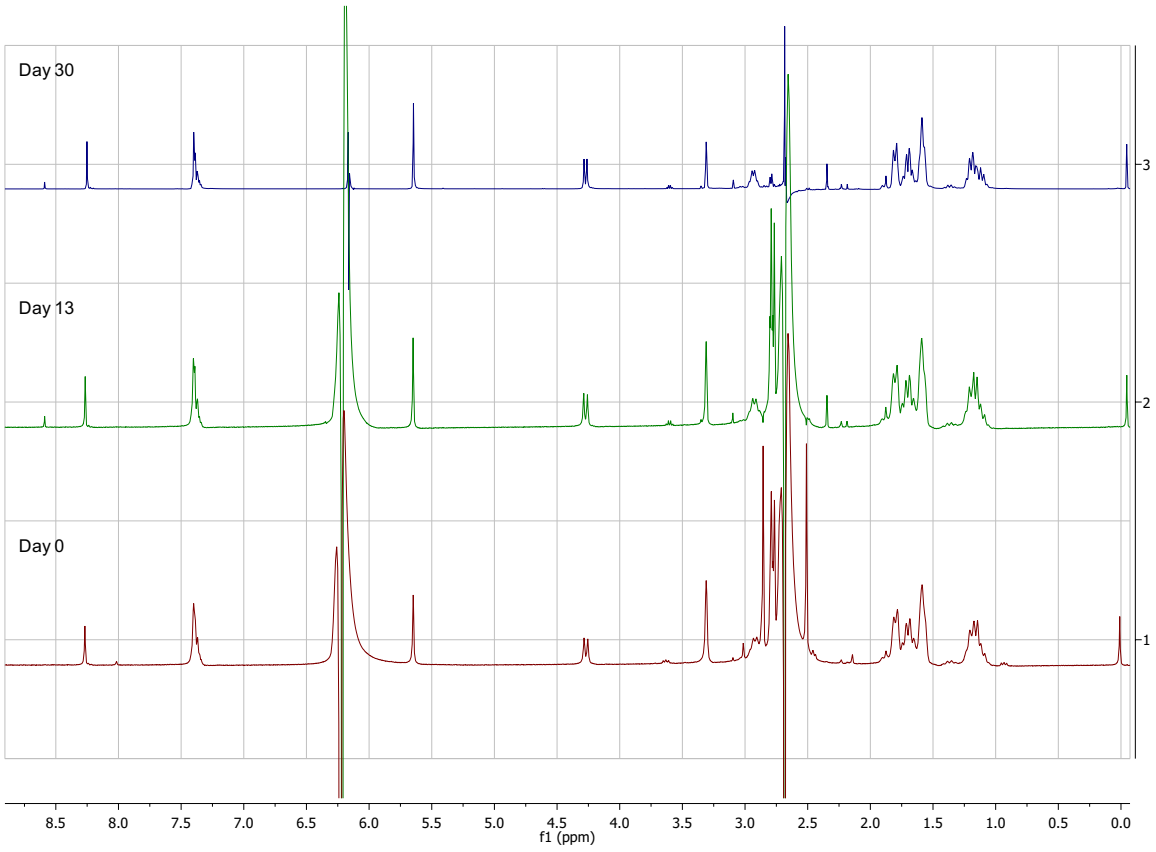


Figure S45: ^{1}H NMR (400 MHz, CD3OH) spectra of compound **1a** in 2 M KOH over 30 days. There was no observable change indicating the compound was very stable under alkaline conditions.

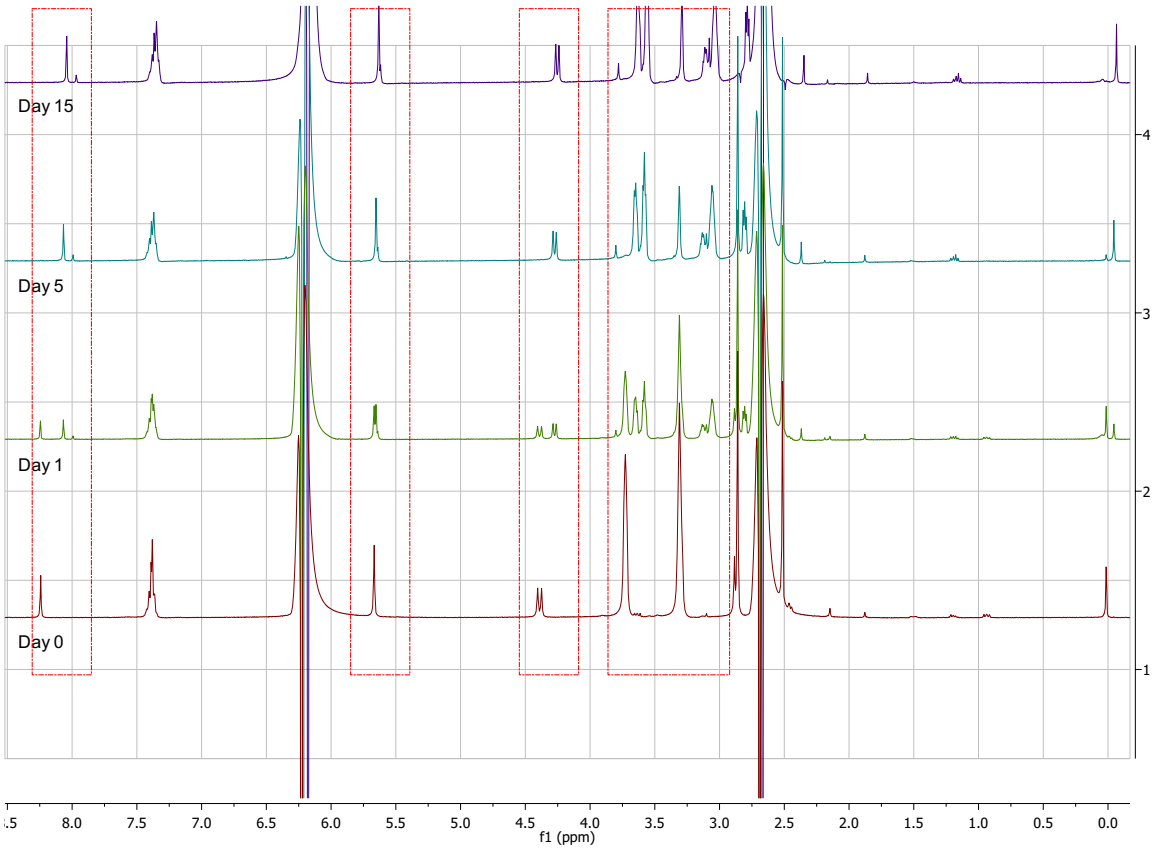


Figure S46: ^{1}H NMR (400 MHz, CD3OH) spectra of compound **2a** in 2 M KOH over 15 days. Half of the compound degraded within 1 day. Nearly all of the compound degraded in 5 days indicating the compound was very unstable under alkaline conditions.

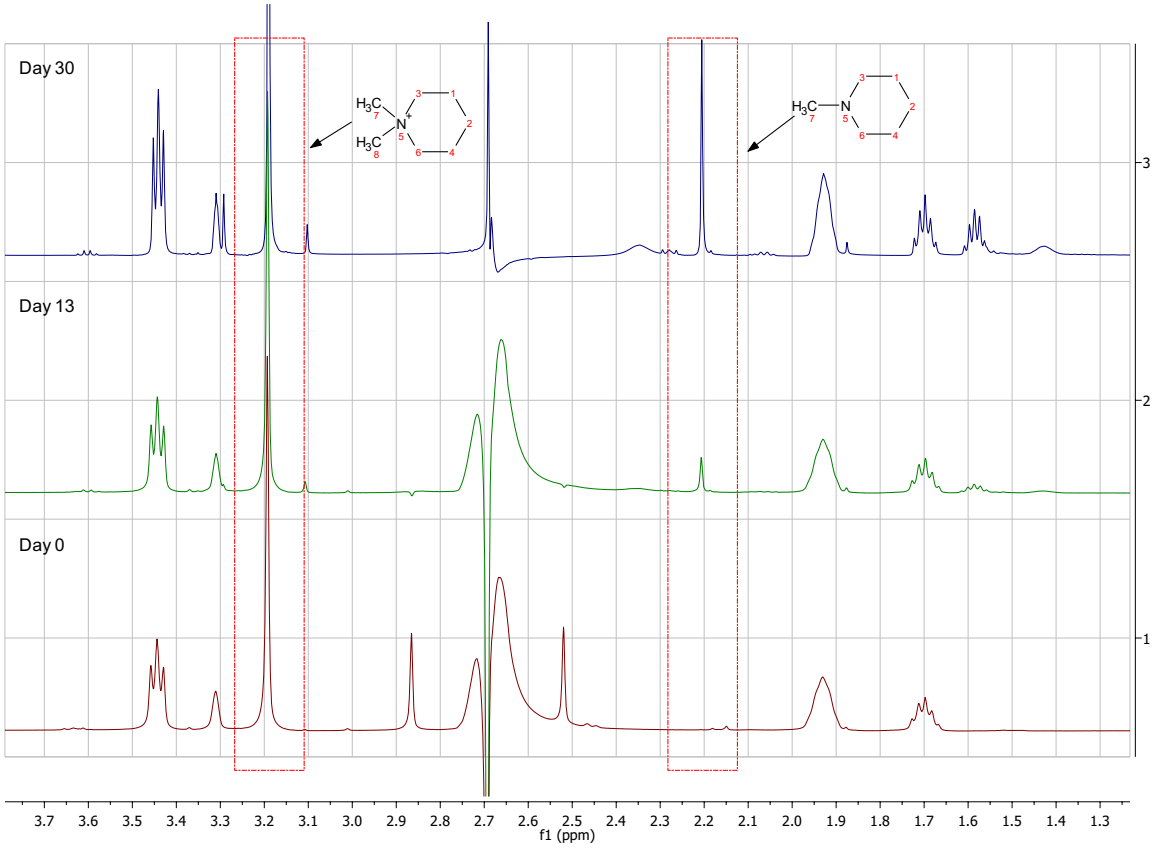
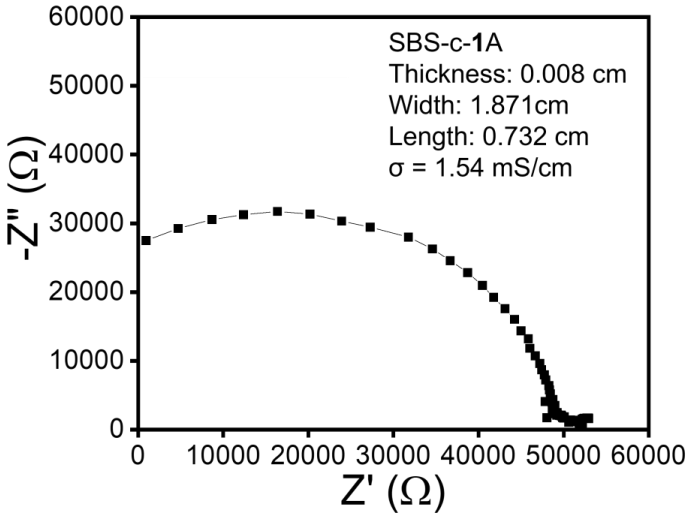
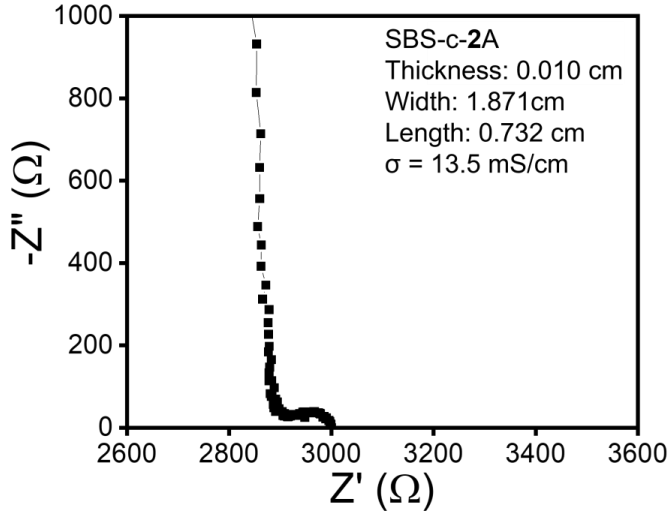


Figure S47: ^{1}H NMR (400 MHz, CD3OH) spectra of compound **3a** in 2 M KOH over 30 days. About 32% degradation of the compound was observed mainly by demethylation.





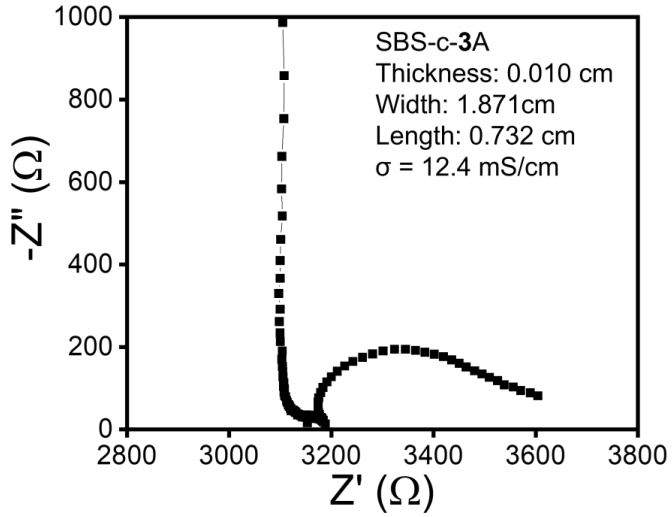


Figure S48: Ionic conductivity of the AEMs.