Supporting Information for

Binaphthyl-based Molecular Barrier Materials for Phosphoric Acid Poisoning in High-Temperature Proton Exchange Membrane Fuel Cells

Dong-Cheol Jeong,[1,#] Bohyun Mun,[2,#] Hyekyung Lee,[1] Seung Jun Hwang,[3,$] Sung Jong Yoo,[3] EunAe Cho,[4] Yunmi Lee[,2] and Changsik Song*[,1]*

[1]Department of Chemistry, Sungkyunkwan University, 2066 Seobu-ro, Jangan-gu, Suwon, Gyeonggi 16419, Republic of Korea. [2]Department of Chemistry, Kwangwoon University, 20 Kwangwoon-ro, Nowon-gu, Seoul 01897, Republic of Korea. [3]Korea Institute of Science and Technology, 5 Hwarang-ro 14-gil, Seongbuk-gu, Seoul 02792, Republic of Korea. [4]Department of Materials Science & Engineering, Korea Advanced Institute of Science and Technology, 291 Daehak-ro, Yuseong-gu, Daejeon 34141, Republic of Korea.

Email: ymlee@kw.ac.kr and songcs@skku.edu

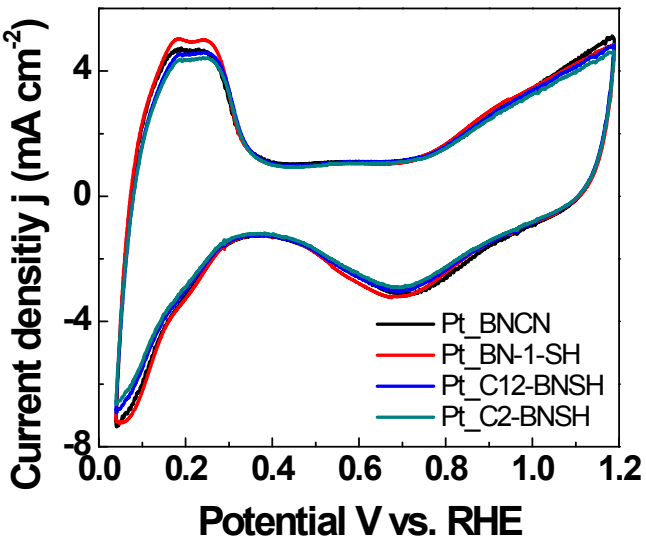

Figure S1. Comparisons of cyclic voltammograms in an N_2-purged 0.1 M $HClO_4$ solution with 0.01 M H_3PO_4 at a scan rate of 50 mV s^{-1}

Table S1. Electrochemically active surface area **(**ECSA) and kinetic current densities at 0.8 V vs. RHE[a]

	specific ECSA ($m^2\ g^{-1}Pt$)	j (mA cm^{-2} at +0.80 V)	j_k (mA cm^{-2} at +0.80 V)
Pt	24.0	5.6	22.1
Pt_PA[b]	22.4	4.5	11.0
Pt_BNSH_PA	23.0	5.5	20.4
Pt_BNCN_PA	22.8	5.3	17.0
Pt_BN-1-SH_PA	24.1	5.2	16.4
Pt_C12-BNSH_PA	21.9	5.0	14.9
Pt_C2-BNSH_PA	21.1	4.8	12.9
Pt_NSH_PA	20.1	3.6	6.9

[a]The ORR activities were measured in 0.1 M $HClO_4$ and 0.01 M H_3PO_4 solutions under O_2 using a glassy carbon rotating disk electrode (RDE) at a rotation and sweep rates of 1600 rpm and 10 mV s^{-1}, respectively.

[b]PA: Phosphoric acid (0.01 M).

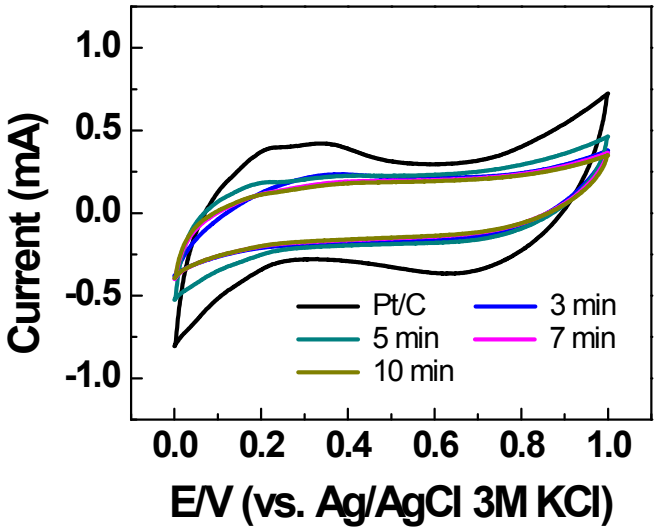

Figure S2. Comparisons of cyclic voltammograms with different dipping times in an N_2-purged 0.1 M $HClO_4$ solution with 0.01 M H_3PO_4 at a scan rate of 100 mV s^{-1}.

■ **^{1}H NMR and ^{13}C NMR spectra for all products:**

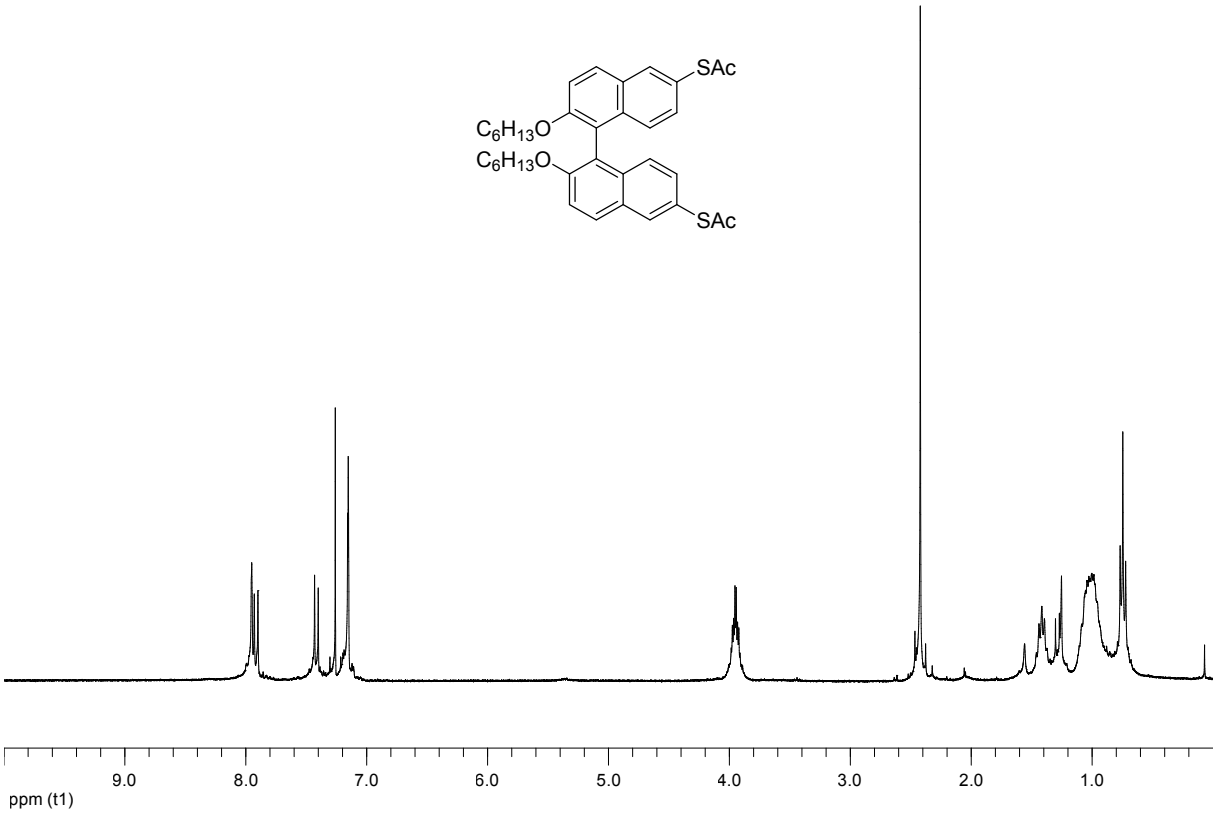

Figure S3. ^{1}H NMR spectrum of compound **2a**

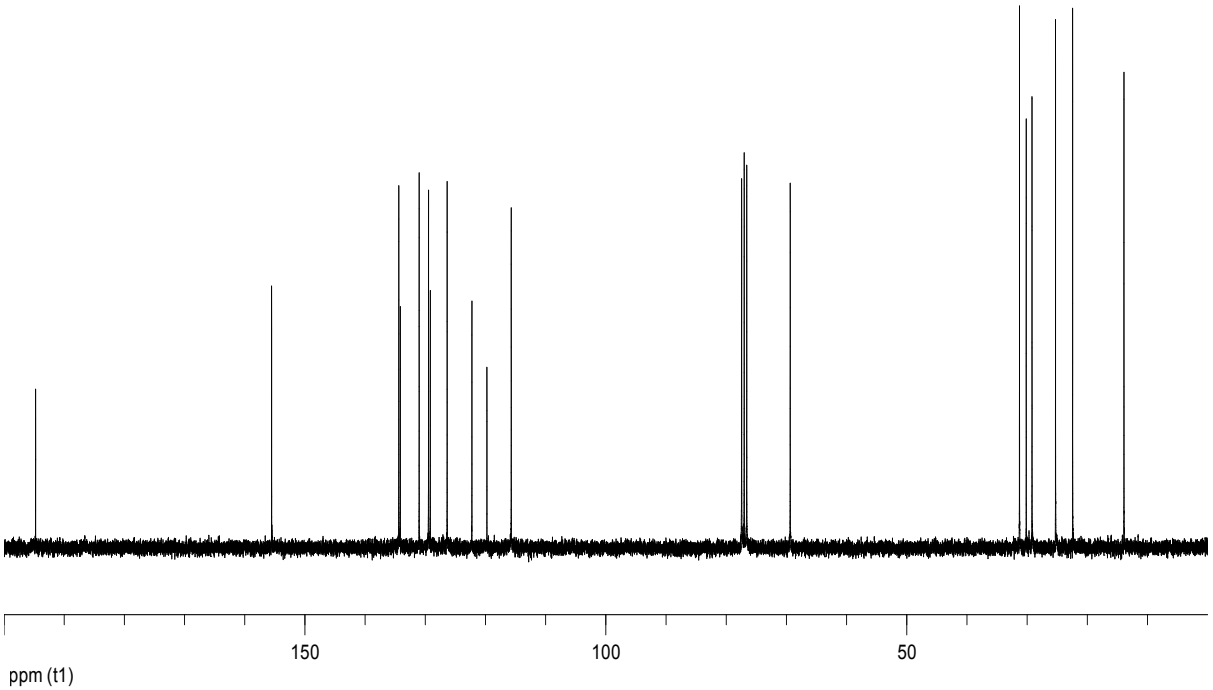

Figure S4. ^{13}C NMR spectrum of compound **2a**

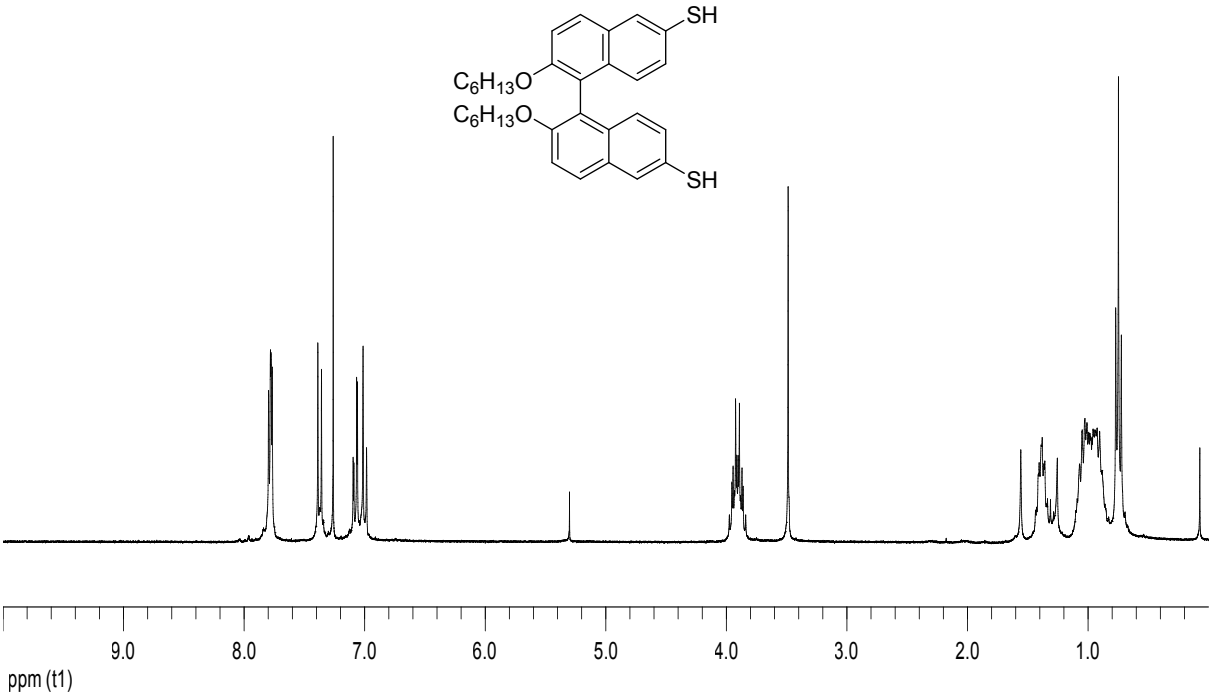

Figure S5. ^{1}H NMR spectrum of compound **BNSH**

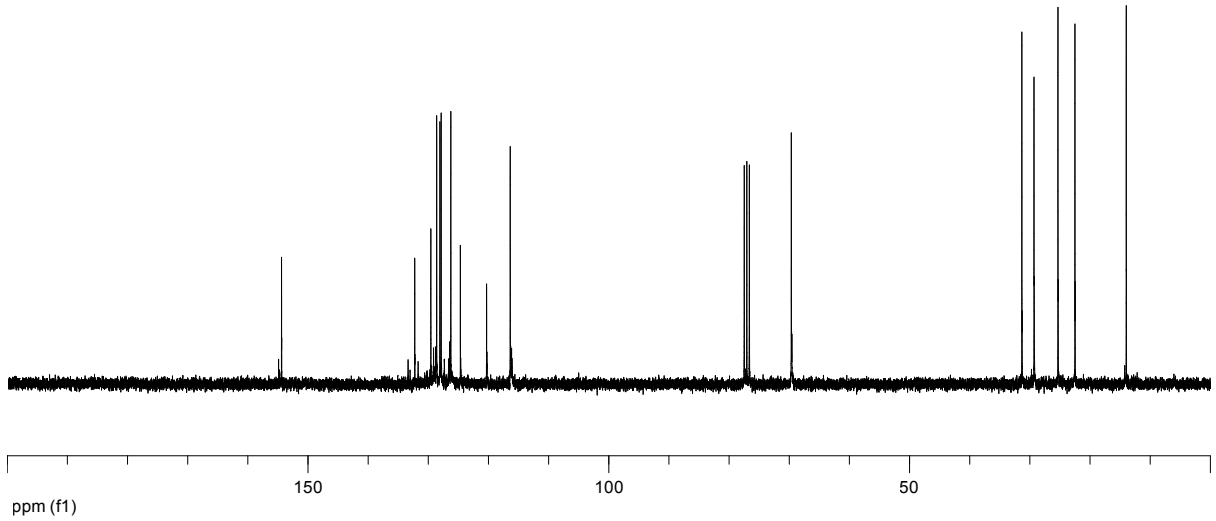

Figure S6. ^{13}C NMR spectrum of compound **BNSH**

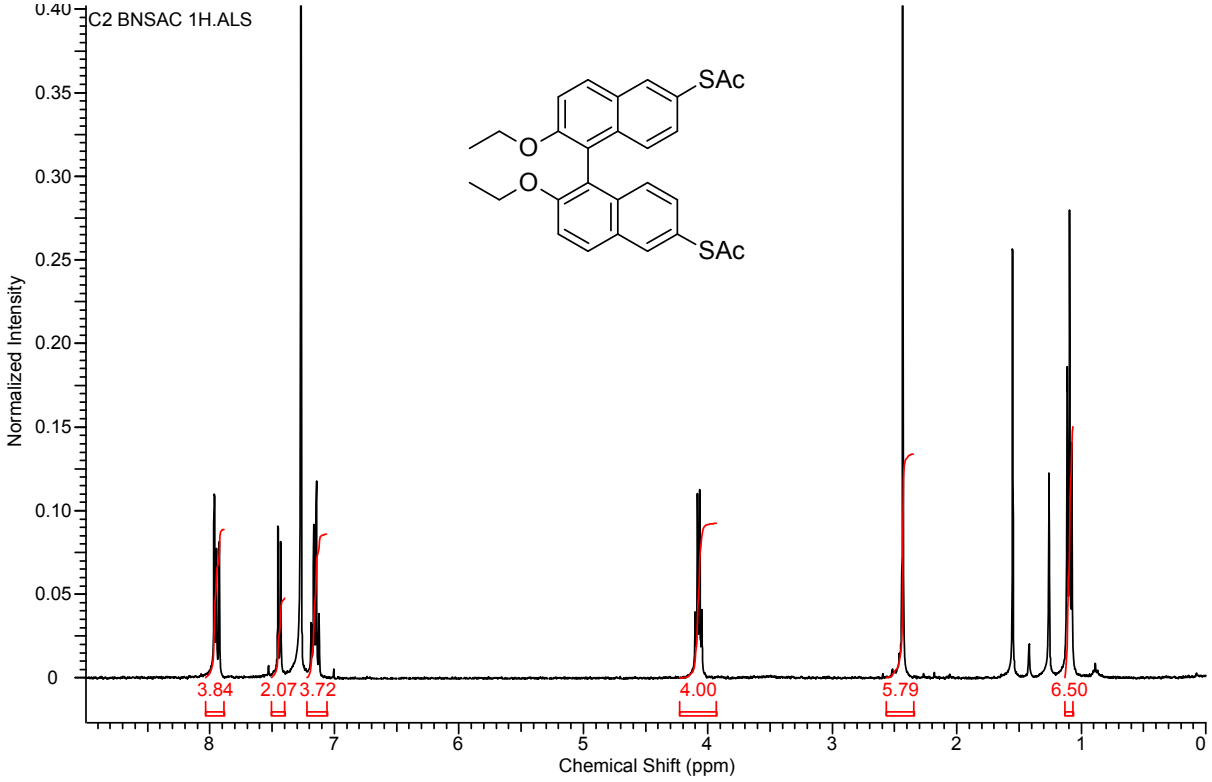

Figure S7. ^{1}H NMR spectrum of compound **2b**

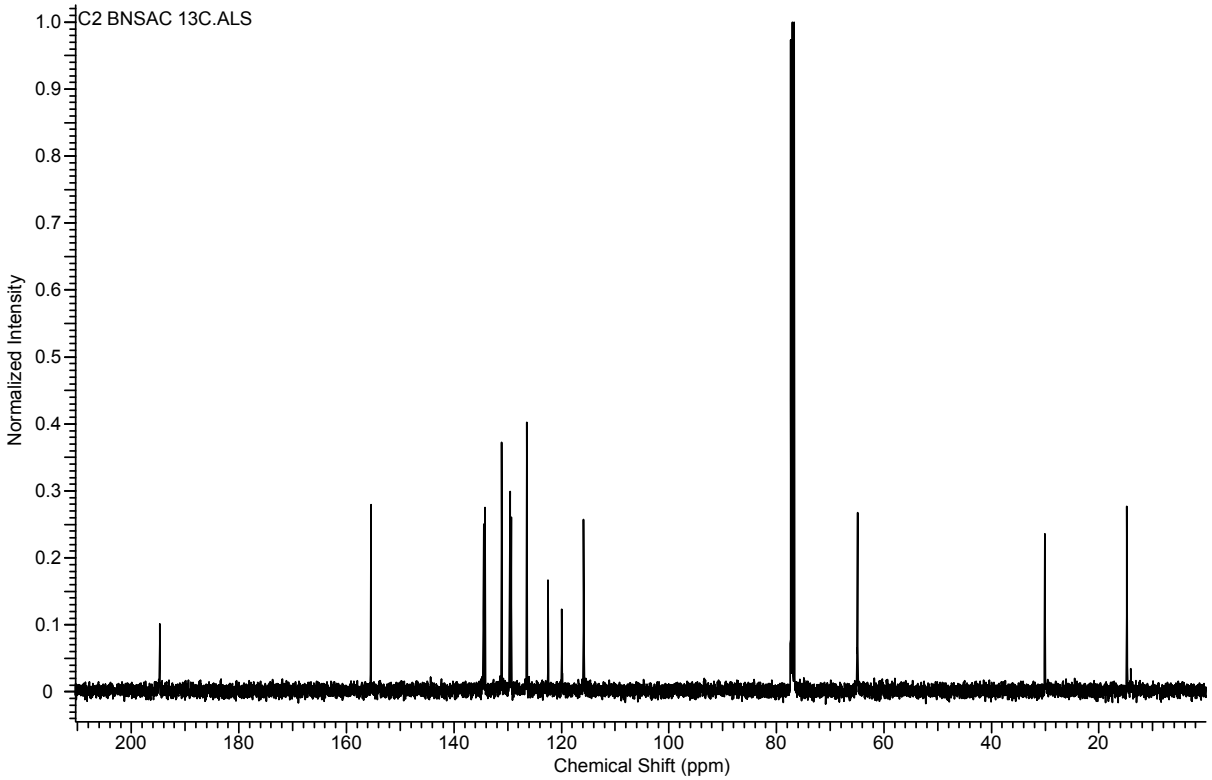

Figure S8. ^{13}C NMR spectrum of compound **2b**

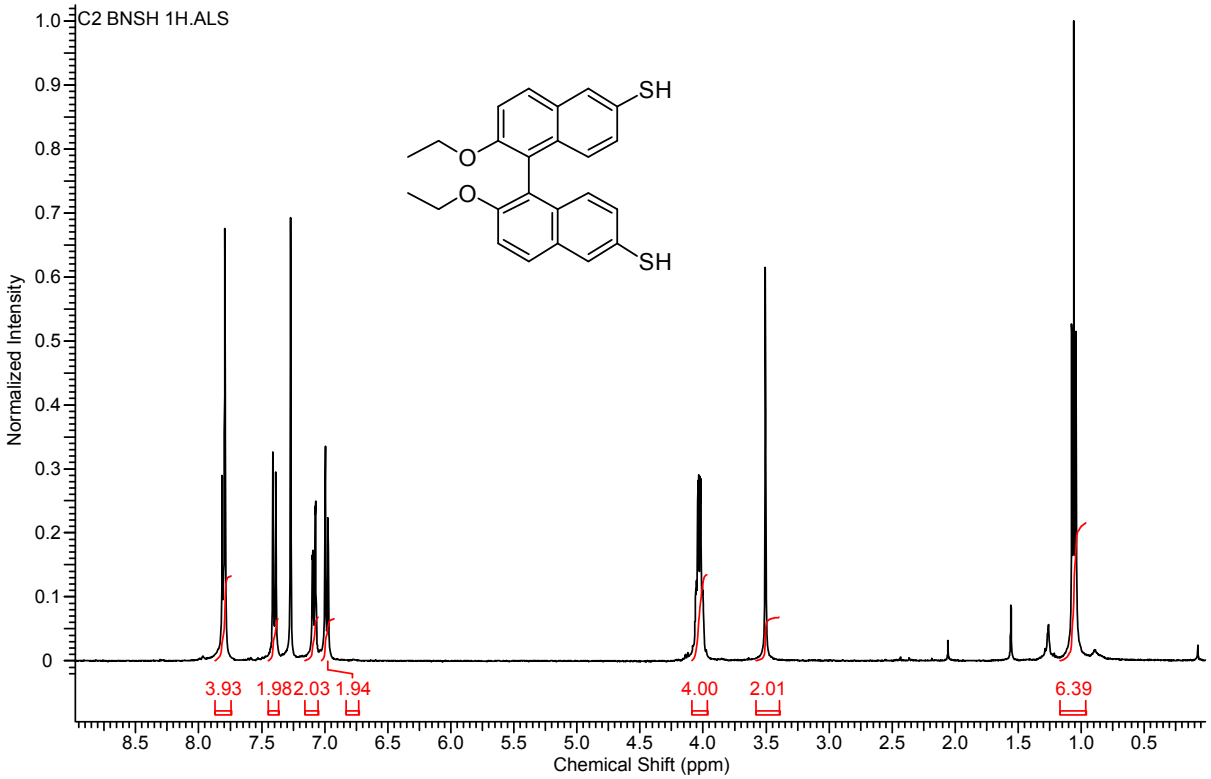

Figure S9. ^{1}H NMR spectrum of compound **C2-BNSH**

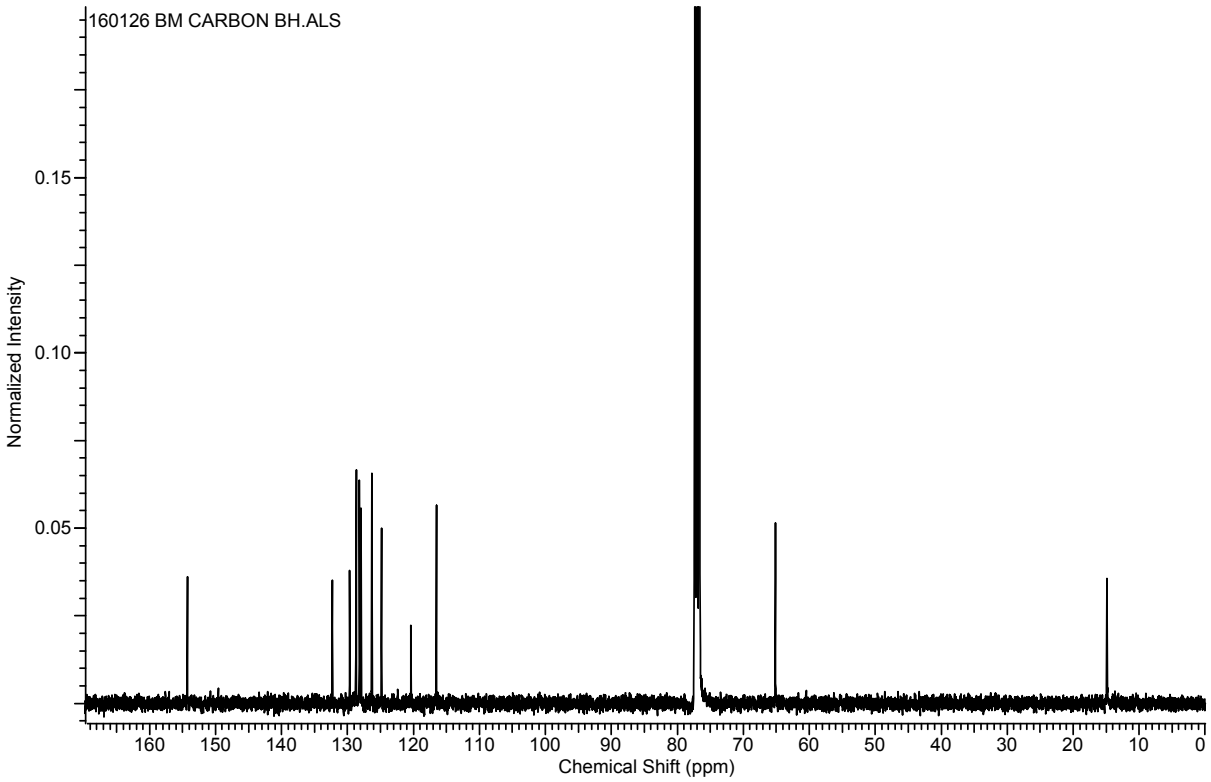

Figure S10. ^{13}C NMR spectrum of compound **C2-BNSH**

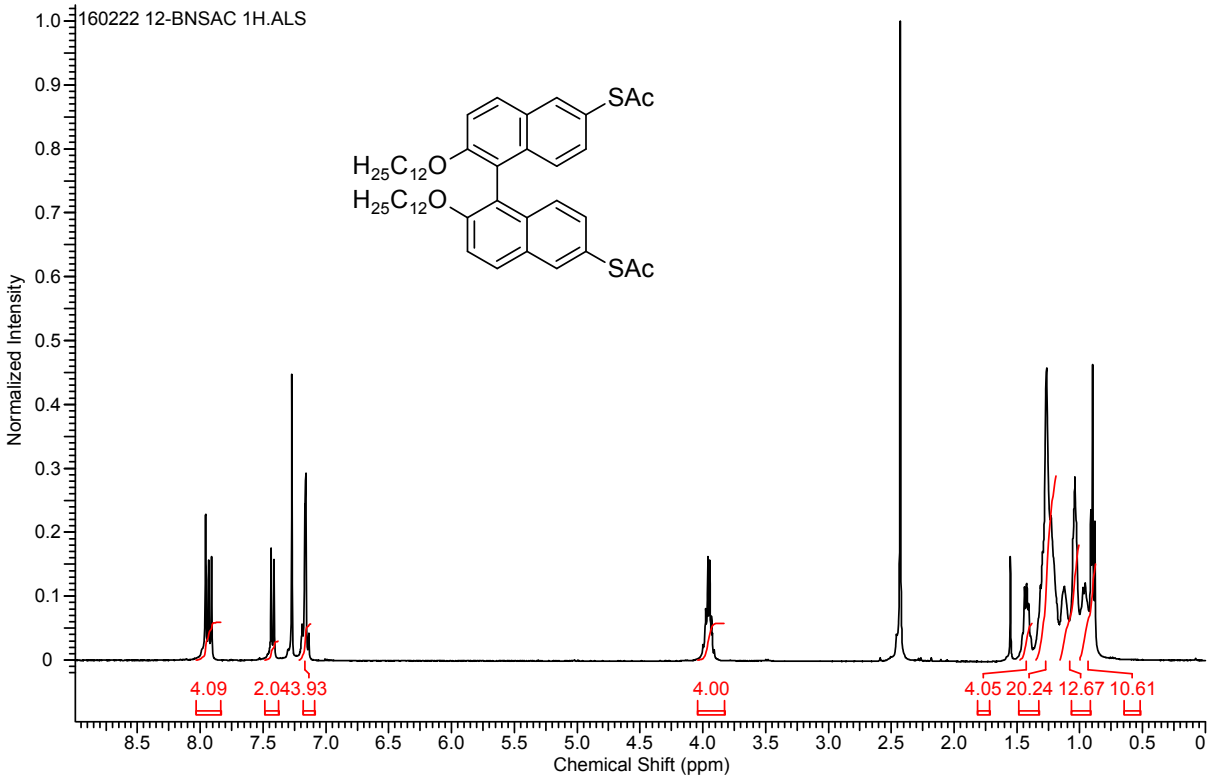

Figure S11. ^{1}H NMR spectrum of compound **2c**

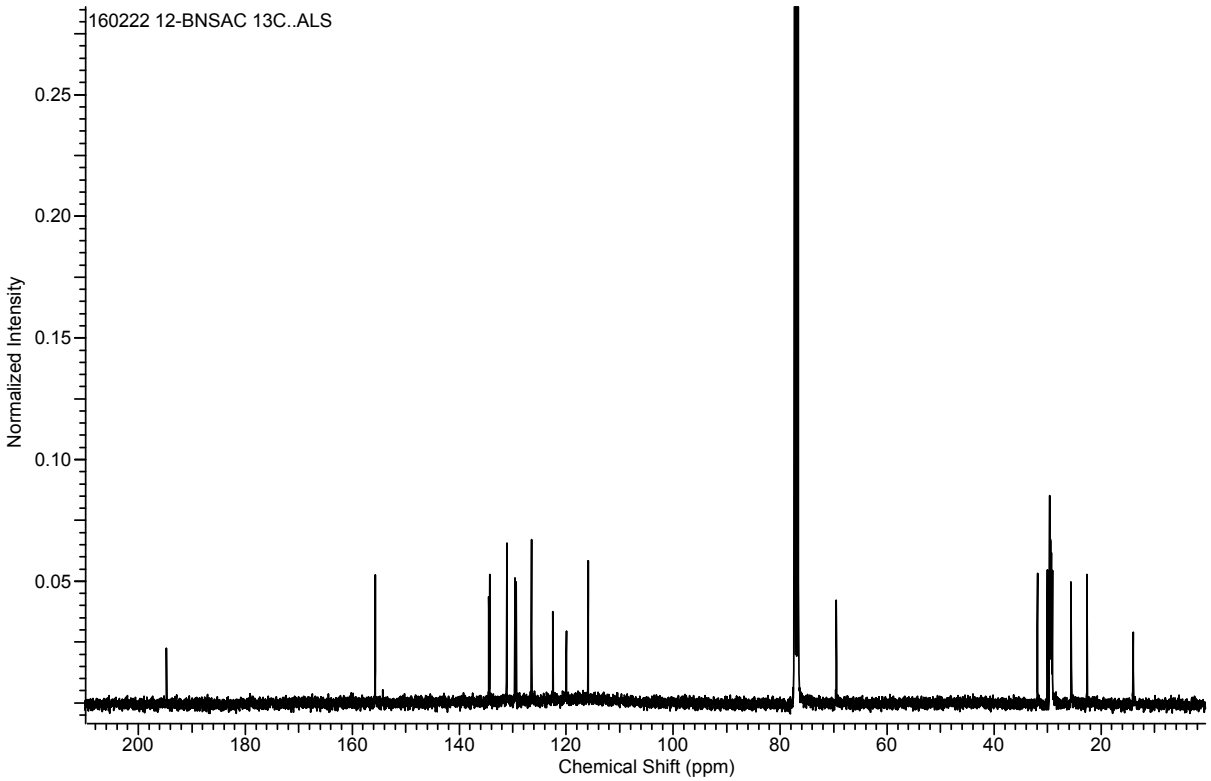

Figure S12. ^{13}C NMR spectrum of compound **2c**

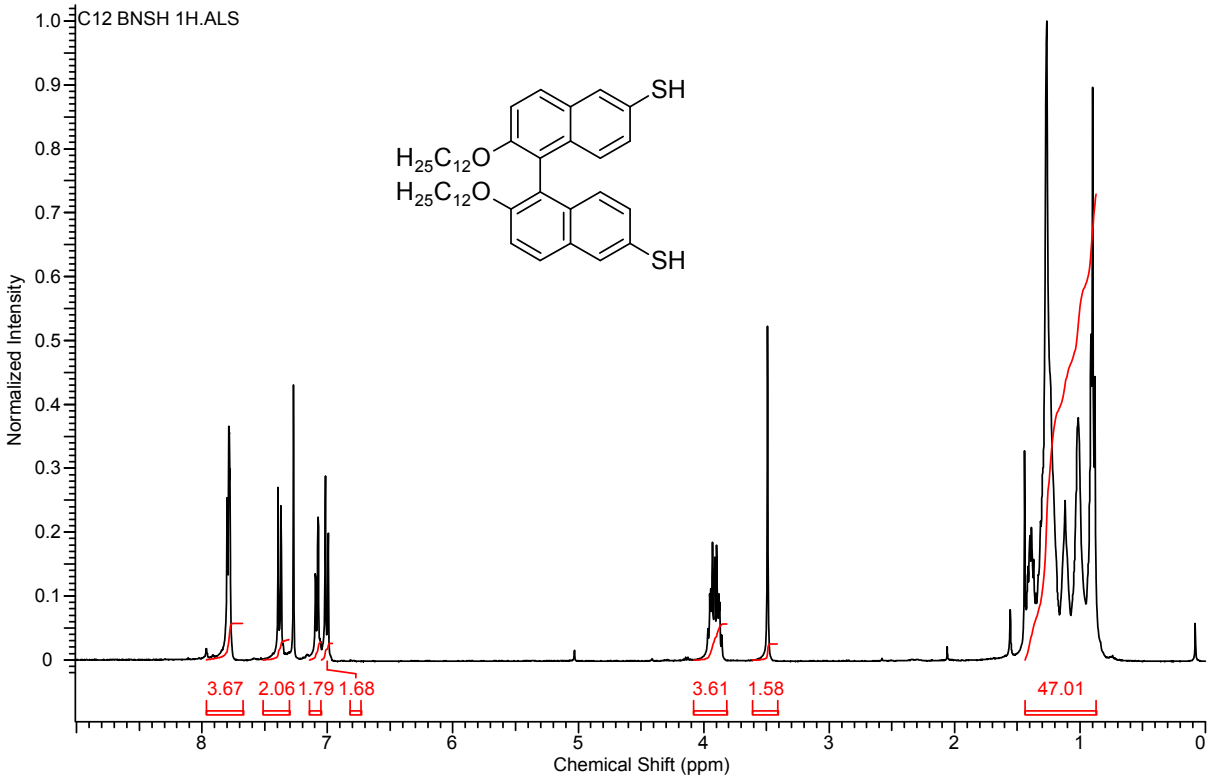

Figure S13. ^{1}H NMR spectrum of compound **C12-BNSH**

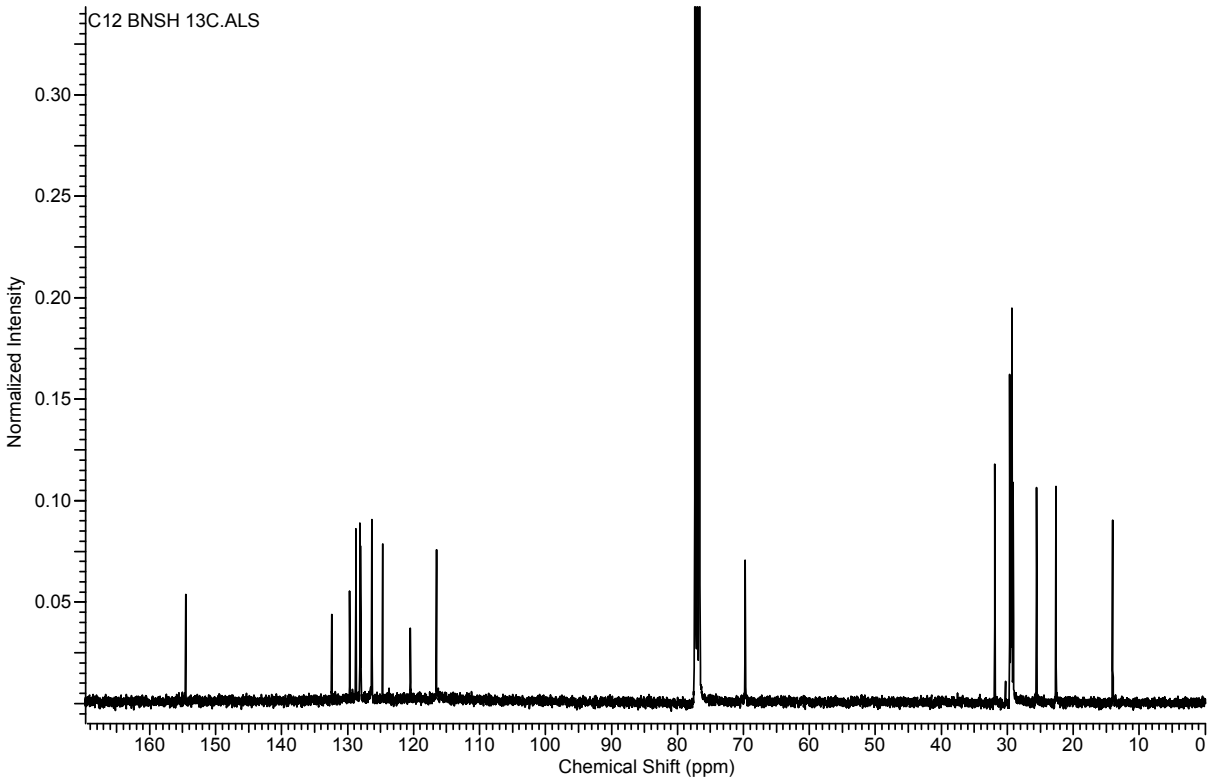

Figure S14. ^{13}C NMR spectrum of compound **C12-BNSH**

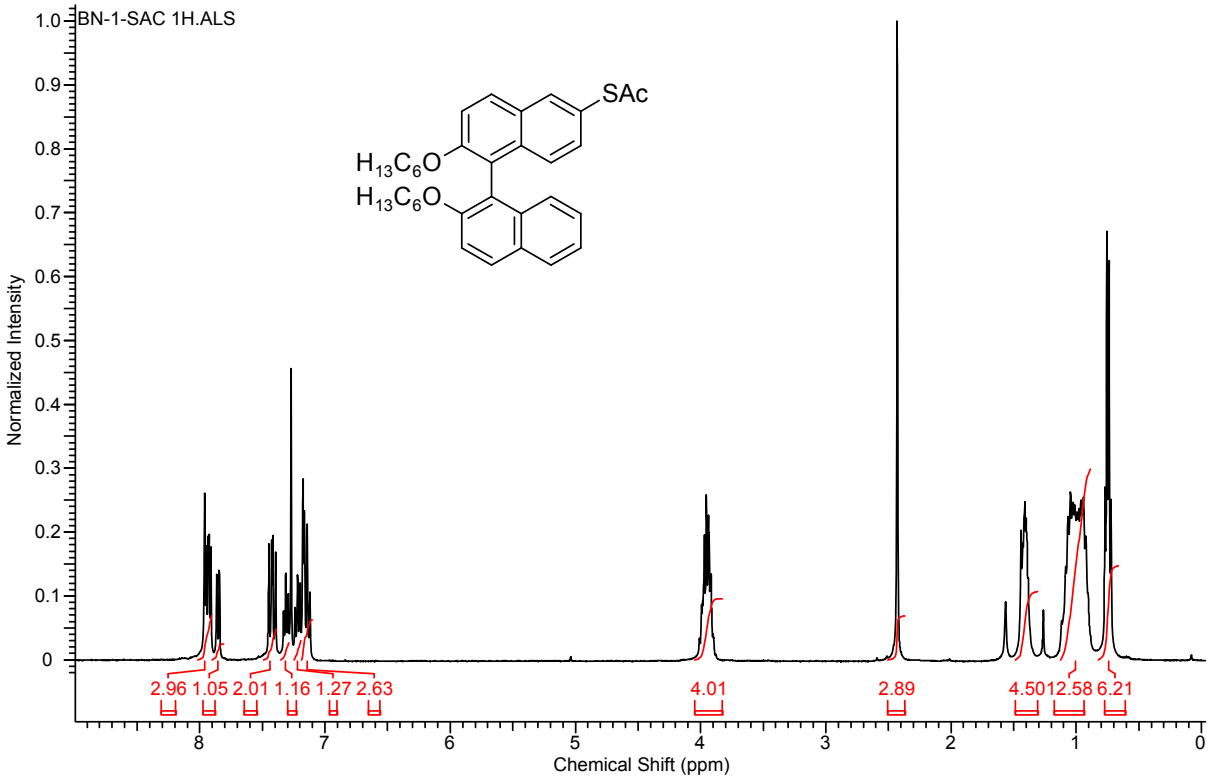

Figure S15. ^{1}H NMR spectrum of compound **2d**

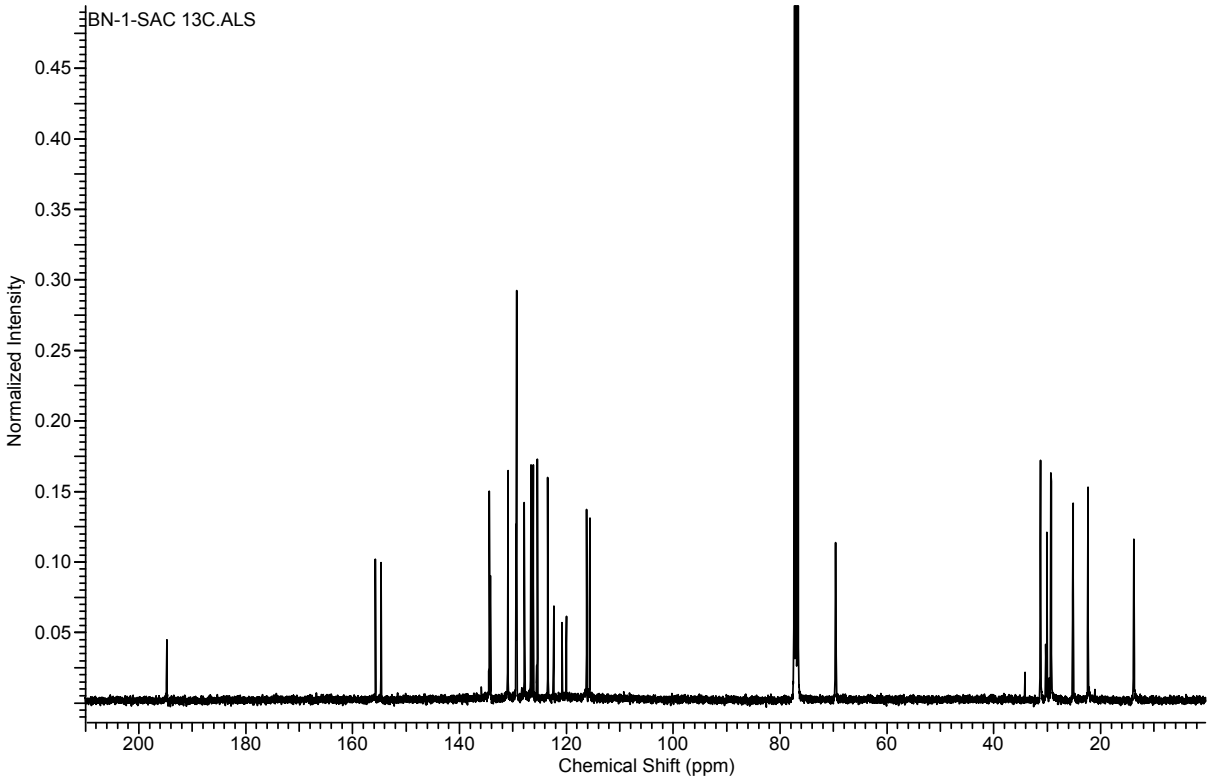

Figure S16. ^{13}C NMR spectrum of compound **2d**

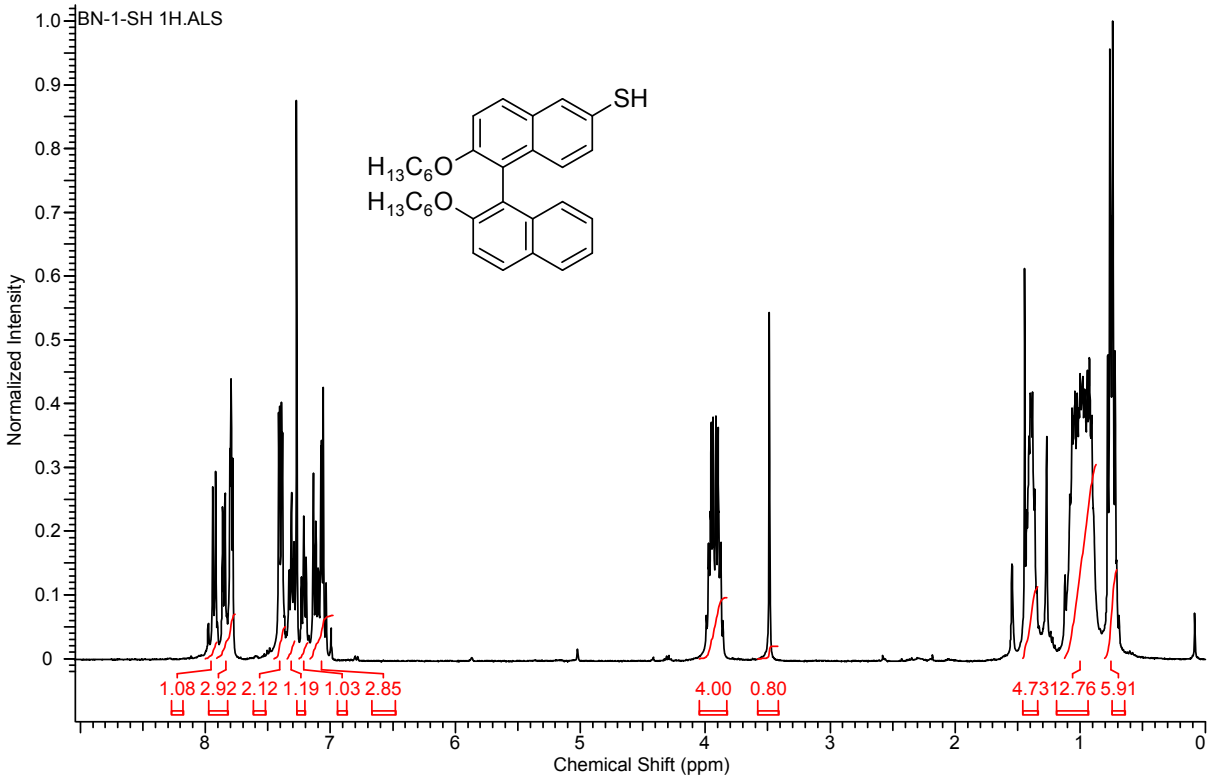

Figure S17. ^{1}H NMR spectrum of compound **BN-1-SH**

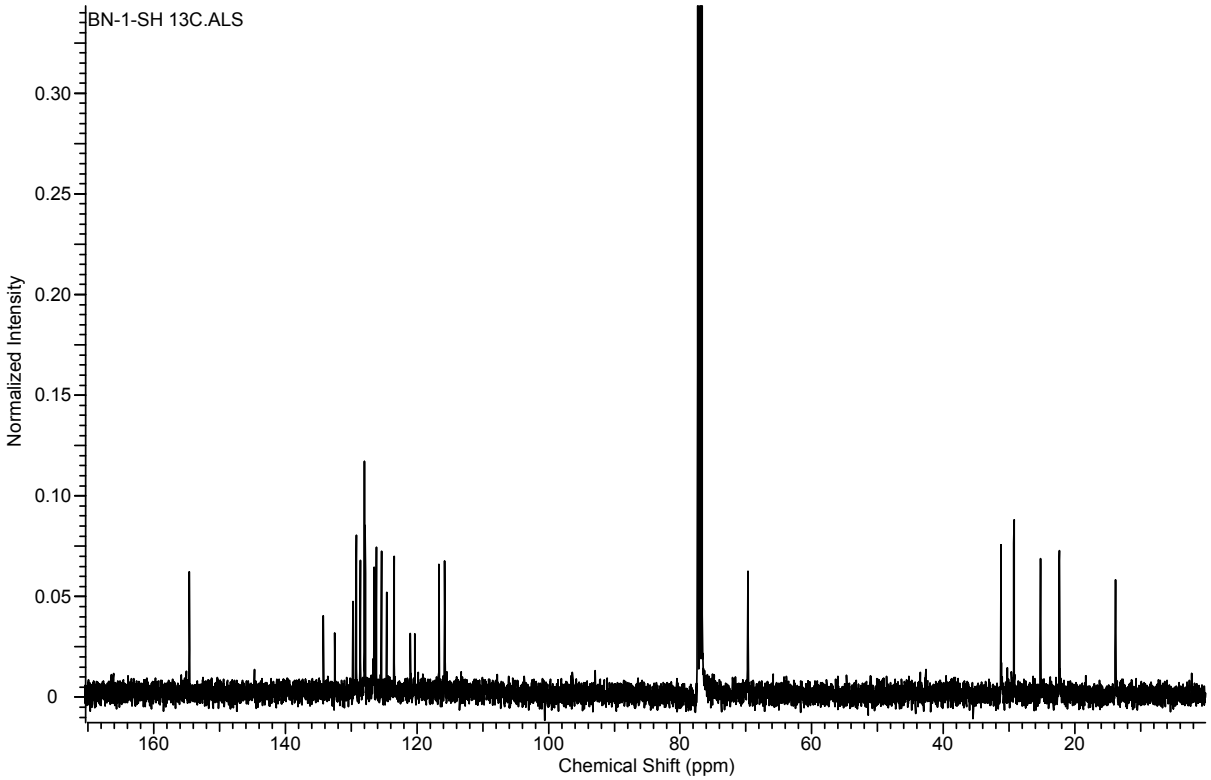

Figure S18. ^{13}C NMR spectrum of compound **BN-1-SH**

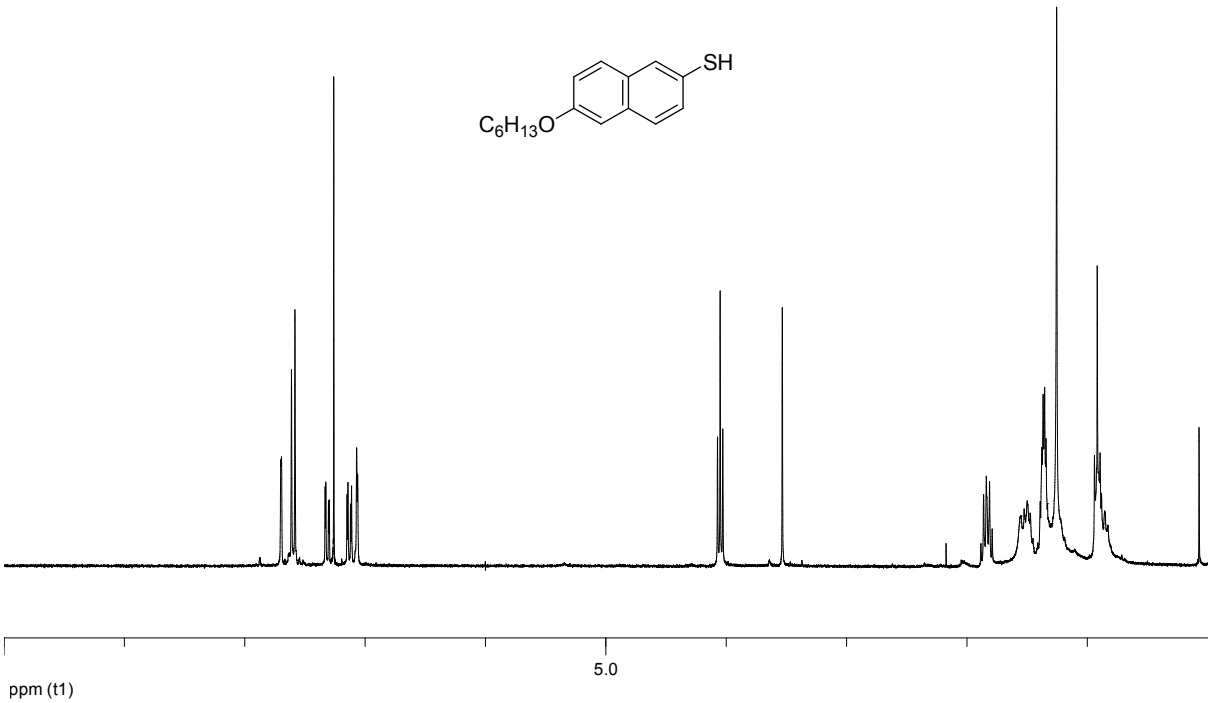

Figure S19. ^{1}H NMR spectrum of compound **NASH**

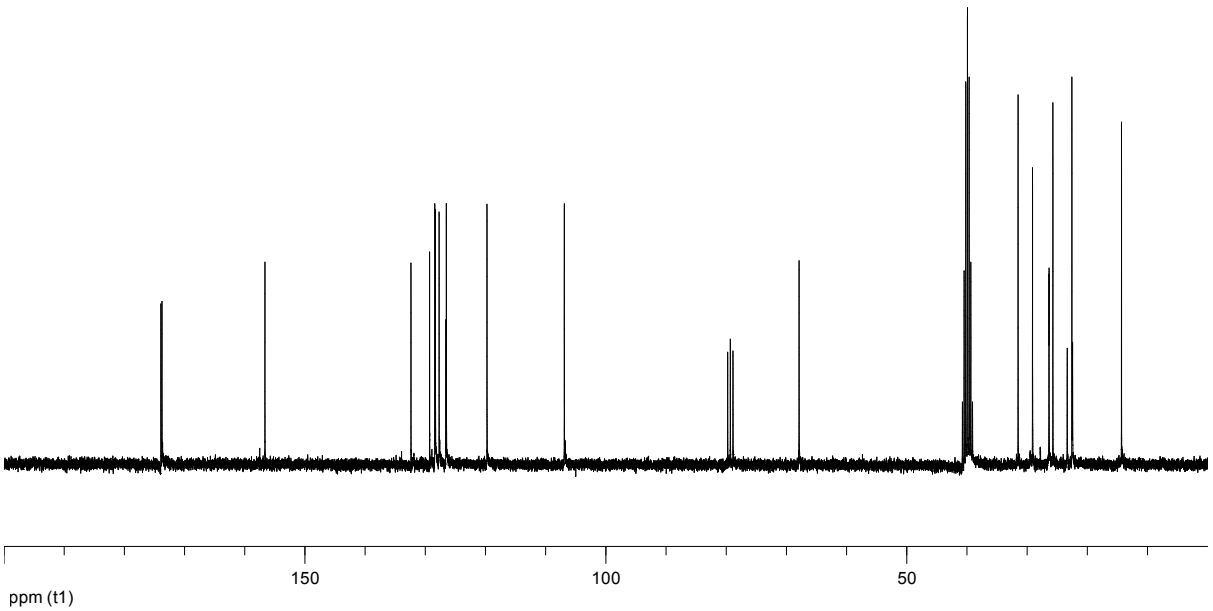

Figure S20. ^{13}C NMR spectrum of compound **NASH**

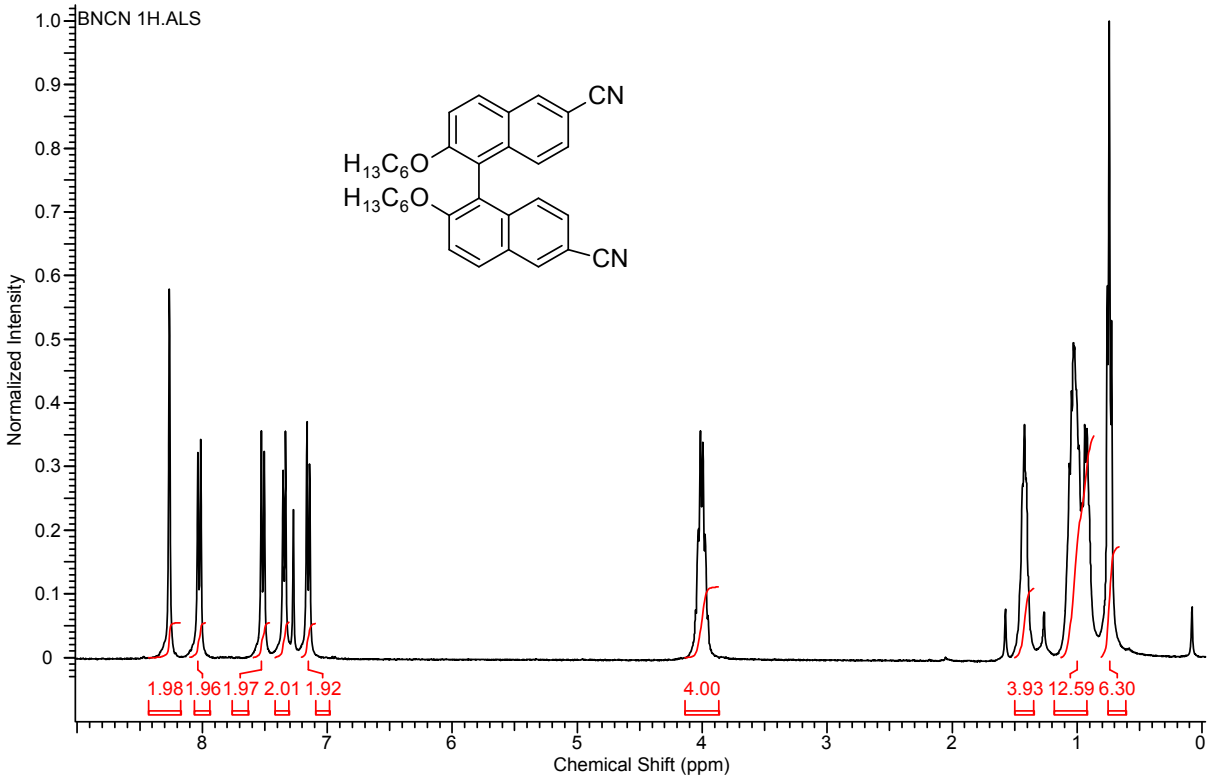

Figure S21. ^{1}H NMR spectrum of compound **BNCN**

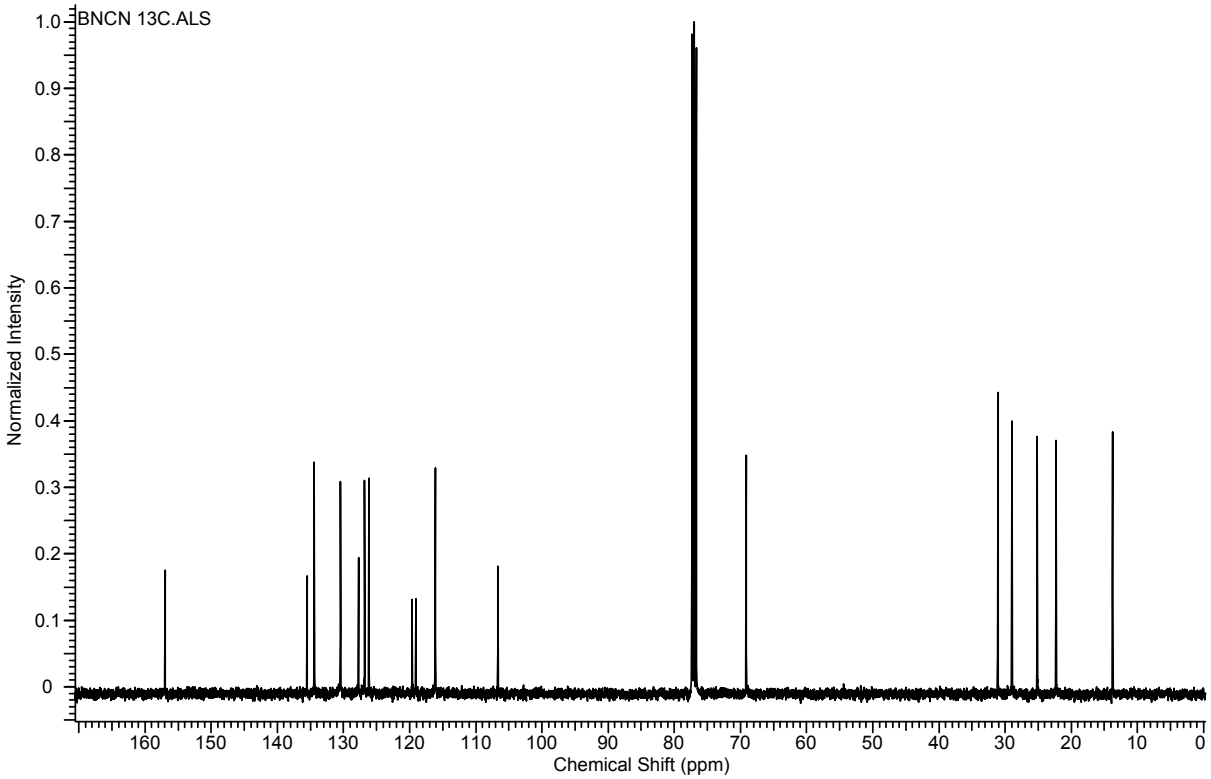

Figure S22. ^{13}C NMR spectrum of compound **BNCN**