

Supporting information

Novel dual acceptor (D-D'-A'- π -A) dye-sensitized solar cells based on triarylamine structure and benzothiadiazole double electron withdrawing unit

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¹H NMR, ¹³C NMR spectra and mass spectra of all unknown compounds are shown in the Supporting Information. (Fig. S1– Fig. S27)

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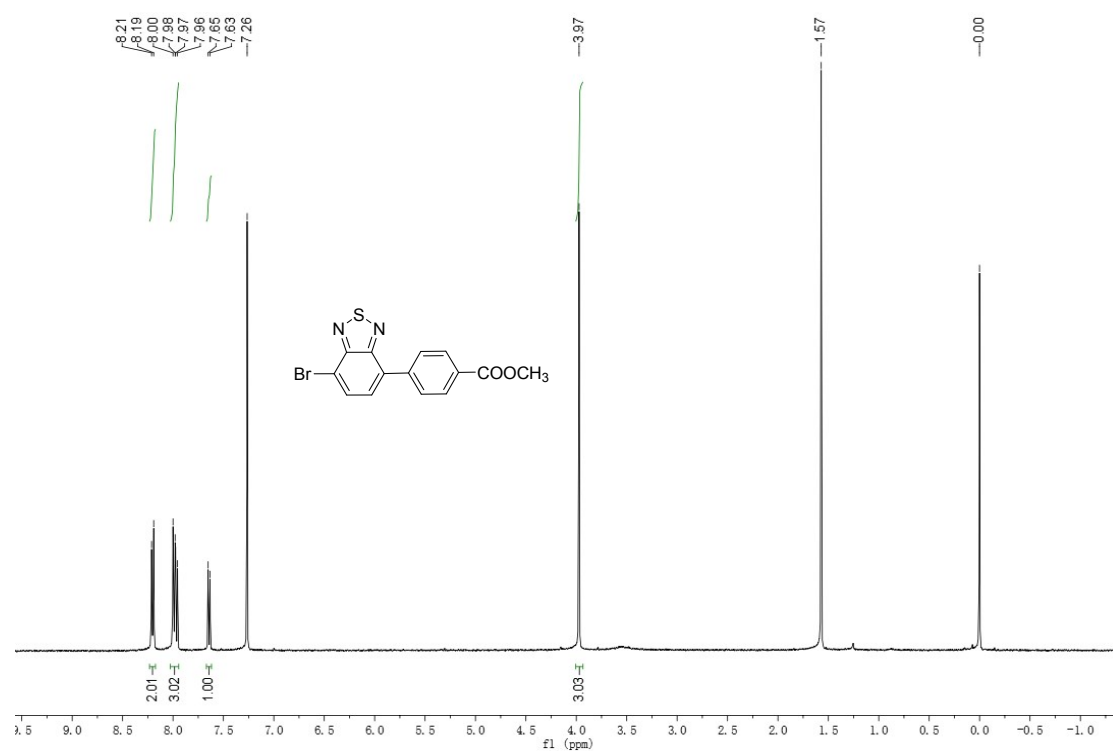


Fig. S1. ¹H NMR of Methyl-4-(7-bromobenzo[c][1,2,5]thiadiazol-4-yl)benzoate (**1**)

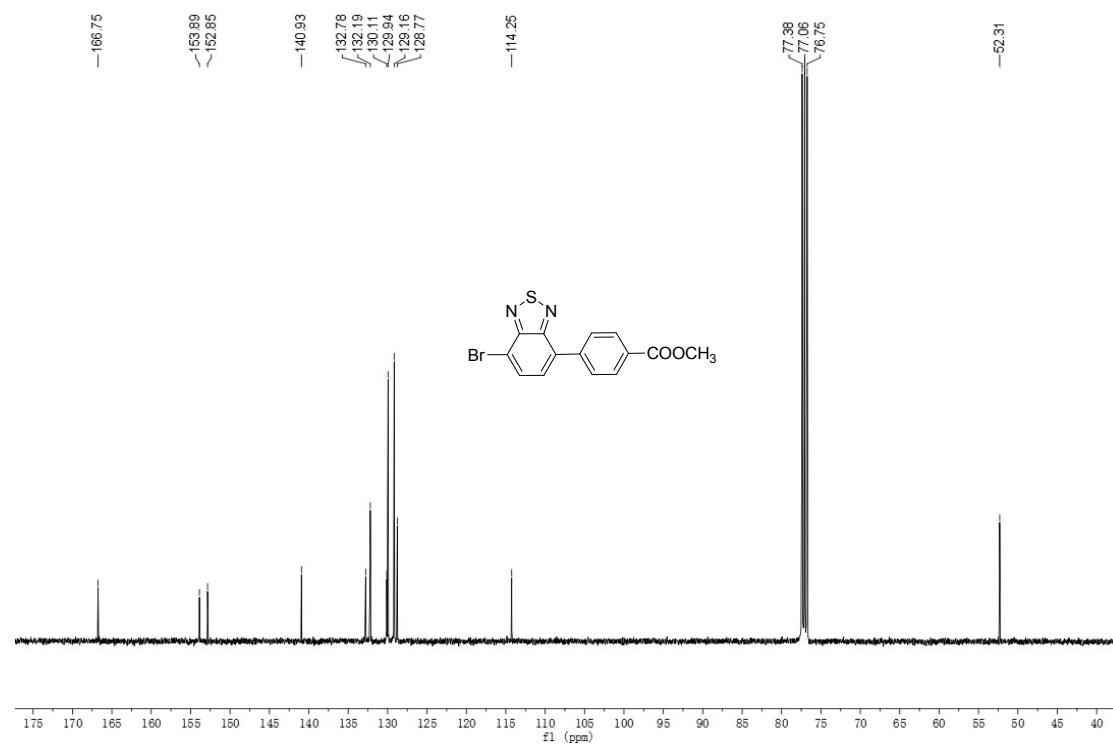


Fig. S2. ¹³C NMR of Methyl-4-(7-bromobenzo[c][1,2,5]thiadiazol-4-yl)benzoate (**1**)

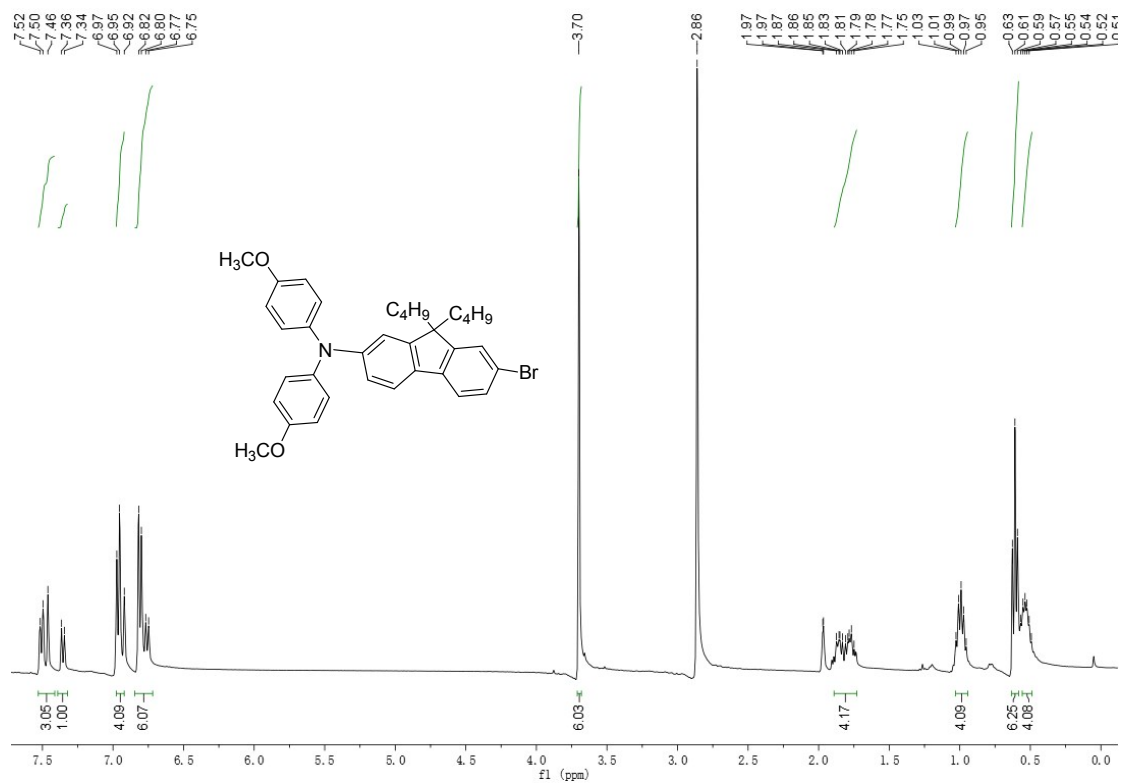


Fig. S3. ¹H NMR of 7-Bromo-9,9-dibutyl-N,N-bis(4-methoxyphenyl)-9H-fluoren-2-amine (**5**)

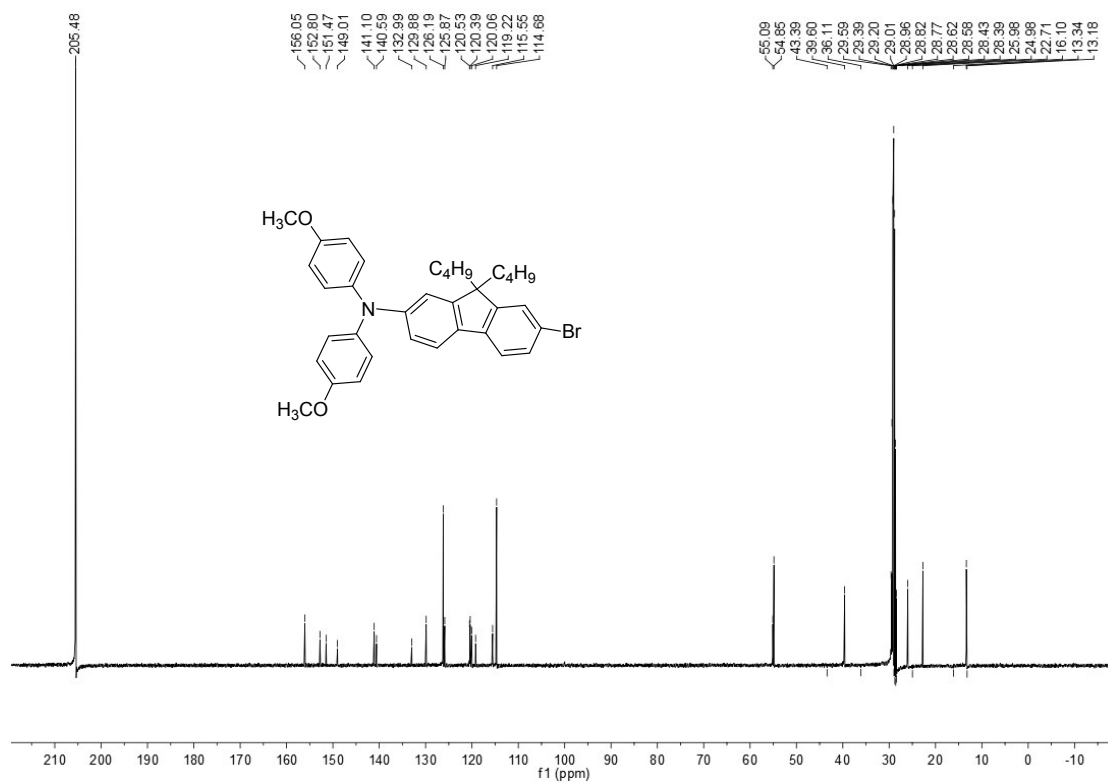
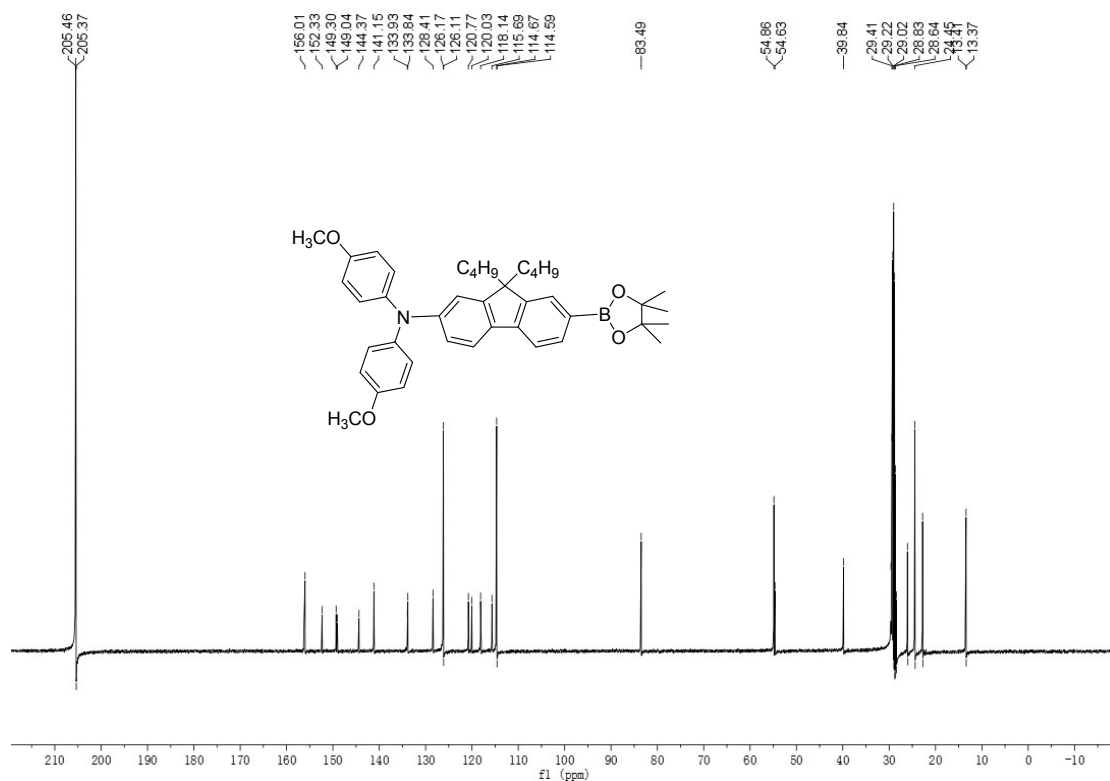
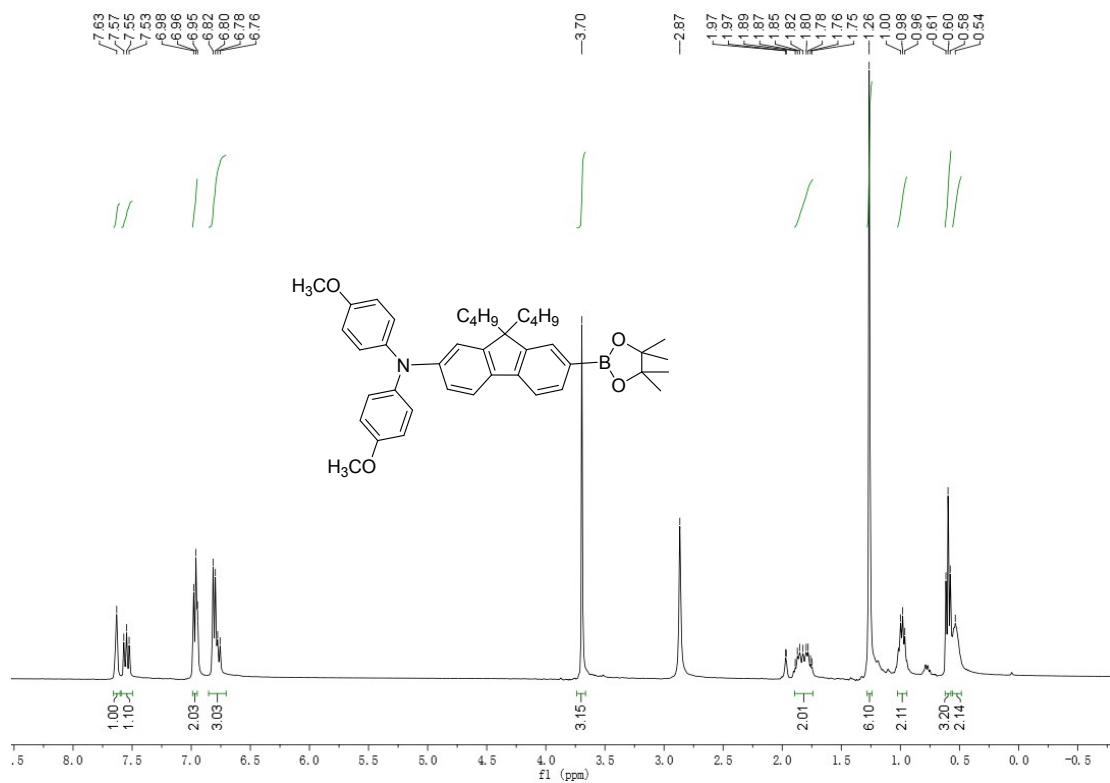


Fig. S4. ¹³C NMR of 7-Bromo-9,9-dibutyl-N,N-bis(4-methoxyphenyl)-9H-fluoren-2-amine (**5**)



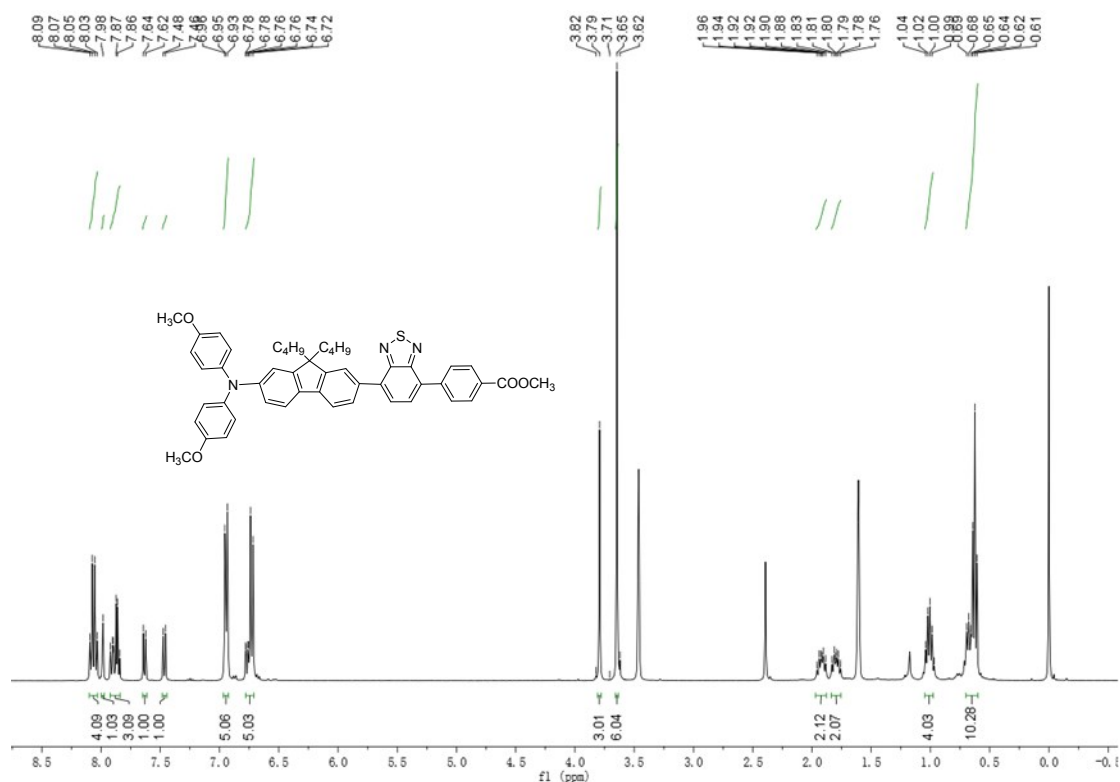


Fig. S7. ¹H NMR of Methyl-4-(7-(7-(bis(4-methoxyphenyl)amino)-9,9-dibutyl-9H-fluoren-2-yl)benzo[c][1,2,5]thiadiazol-4-yl)benzoate (**11**)

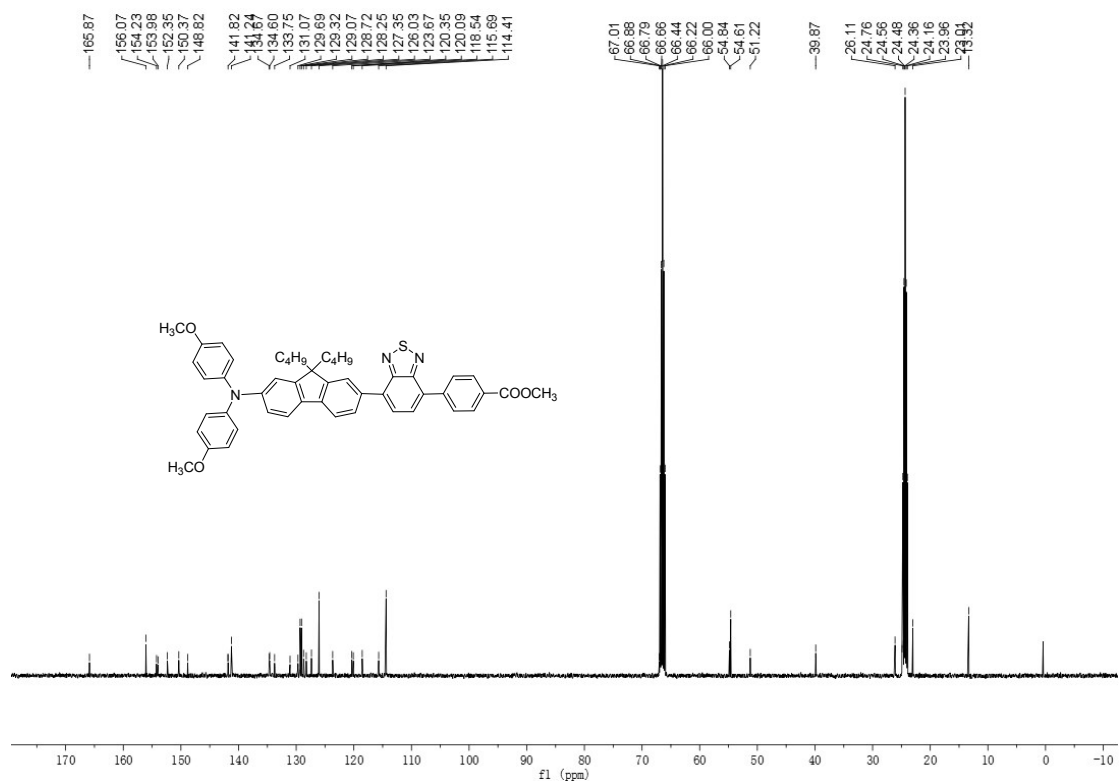


Fig. S8. ¹³C NMR of Methyl-4-(7-(7-(bis(4-methoxyphenyl)amino)-9,9-dibutyl-9H-fluoren-2-yl)benzo[c][1,2,5]thiadiazol-4-yl)benzoate (**11**)

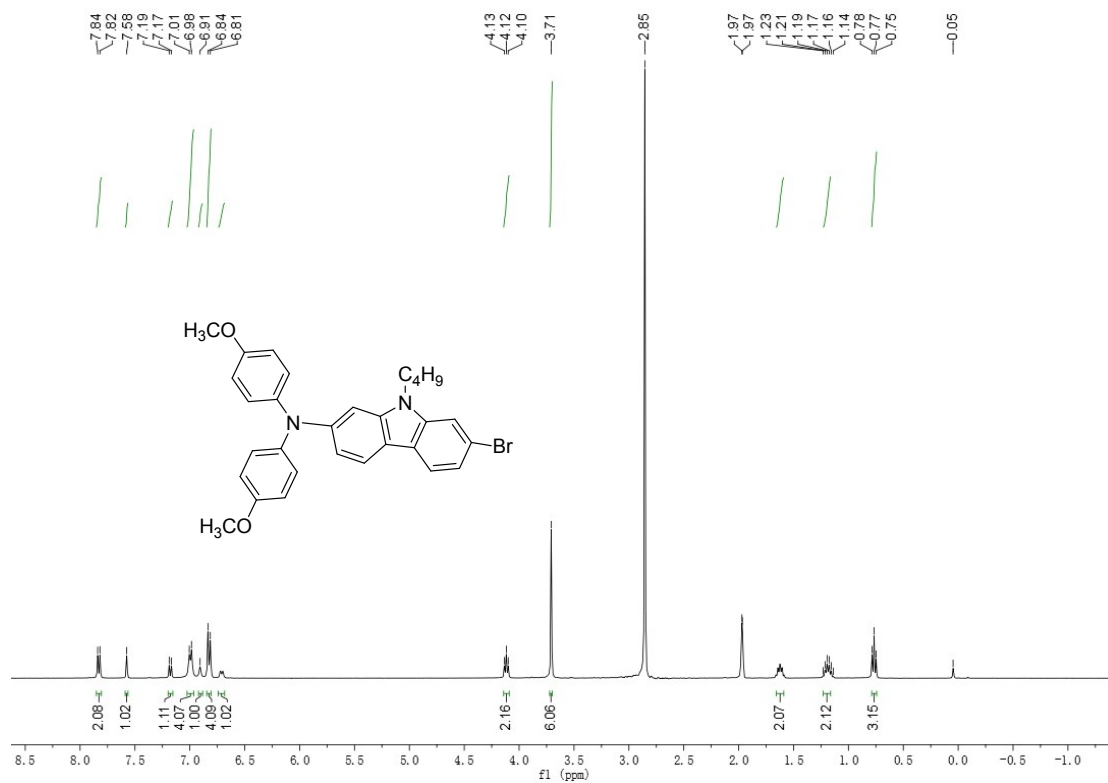


Fig. S9. ¹H NMR of 7-Bromo-9-butyl-N,N-bis(4-methoxyphenyl)-9H-carbazol-2-amine (6)

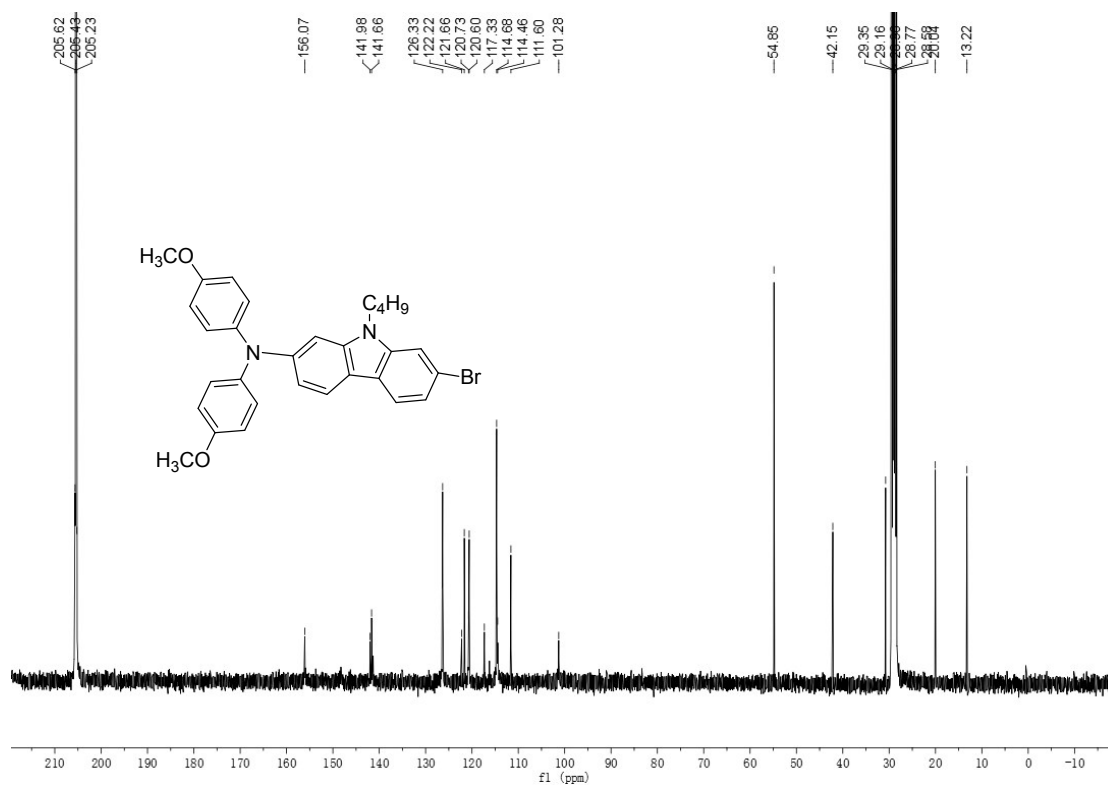


Fig. S10. ¹³C NMR of 7-Bromo-9-butyl-N,N-bis(4-methoxyphenyl)-9H-carbazol-2-amine (6)

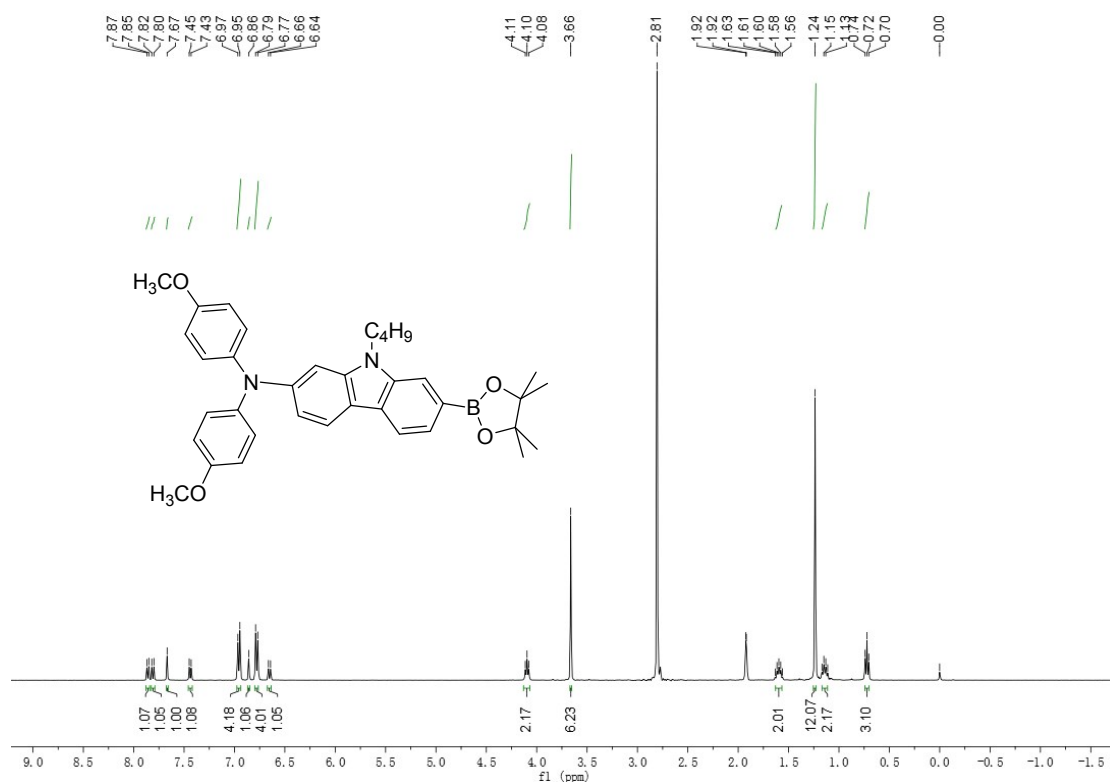


Fig. S11. ¹H NMR of 9-Butyl-N,N-bis(4-methoxyphenyl)-7-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-9H-carbazol-2-amine (**9**)

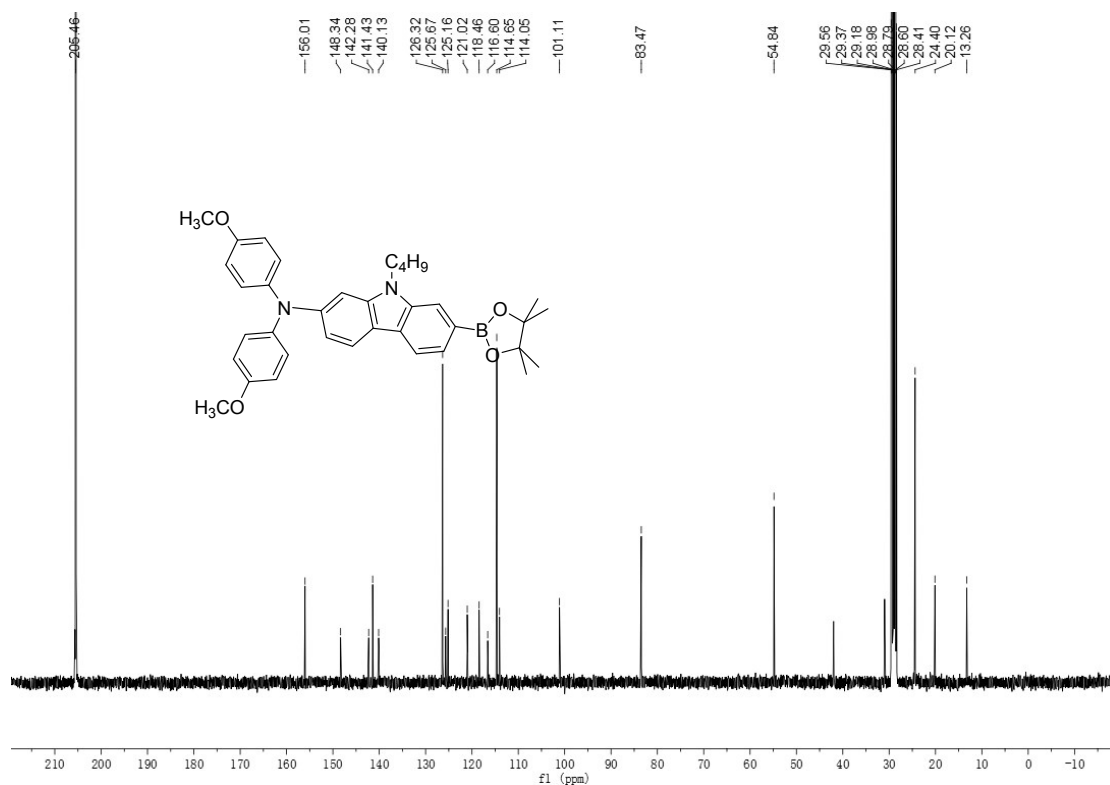


Fig. S12. ¹³C NMR of 9-Butyl-N,N-bis(4-methoxyphenyl)-7-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-9H-carbazol-2-amine (**9**)

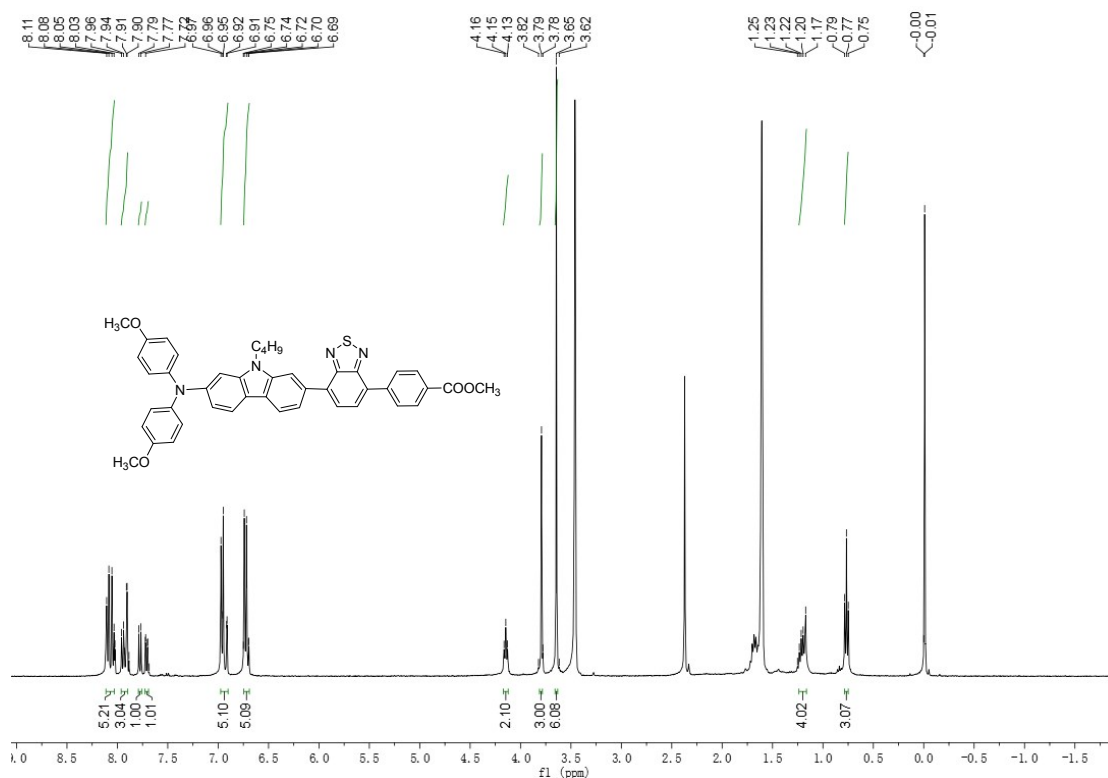


Fig. S13. ^1H NMR of Methyl-4-(7-(7-(bis(4-methoxyphenyl)amino)-9-butyl-9H-carbazol-2-yl)benzo[c][1,2,5]thiadiazol-4-yl)benzoate (**12**)

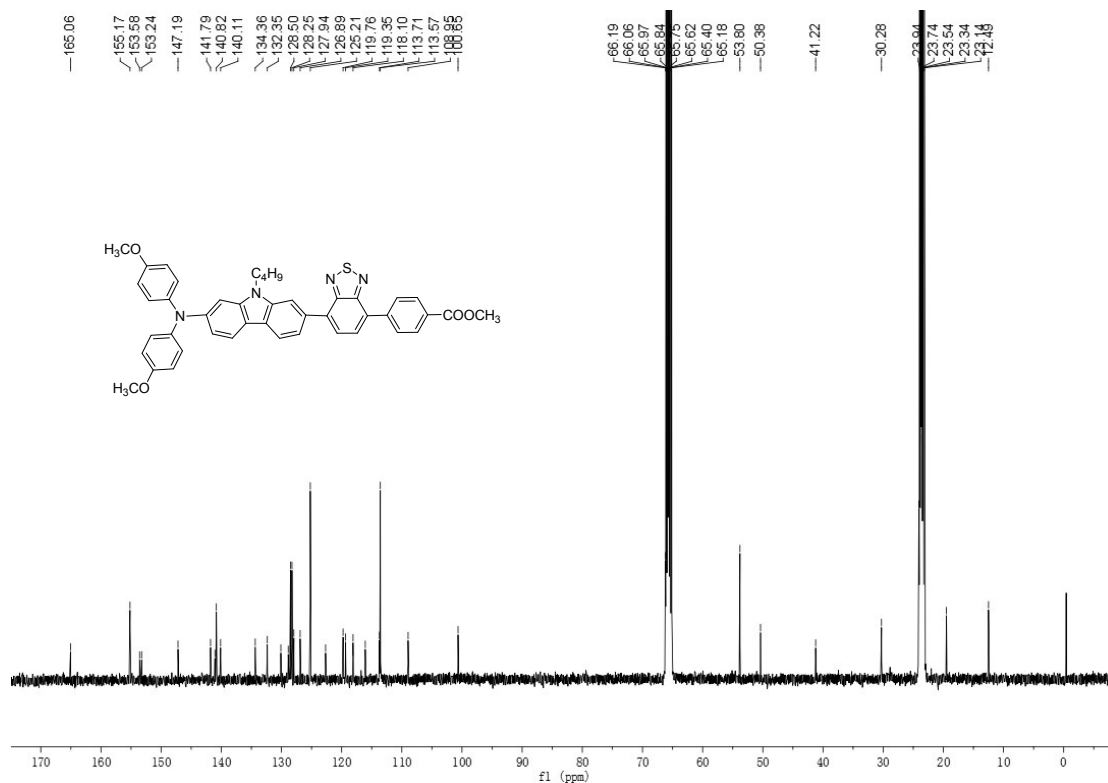


Fig. S14. ^{13}C NMR of Methyl-4-(7-(7-(bis(4-methoxyphenyl)amino)-9-butyl-9H-carbazol-2-yl)benzo[c][1,2,5]thiadiazol-4-yl)benzoate (**12**)

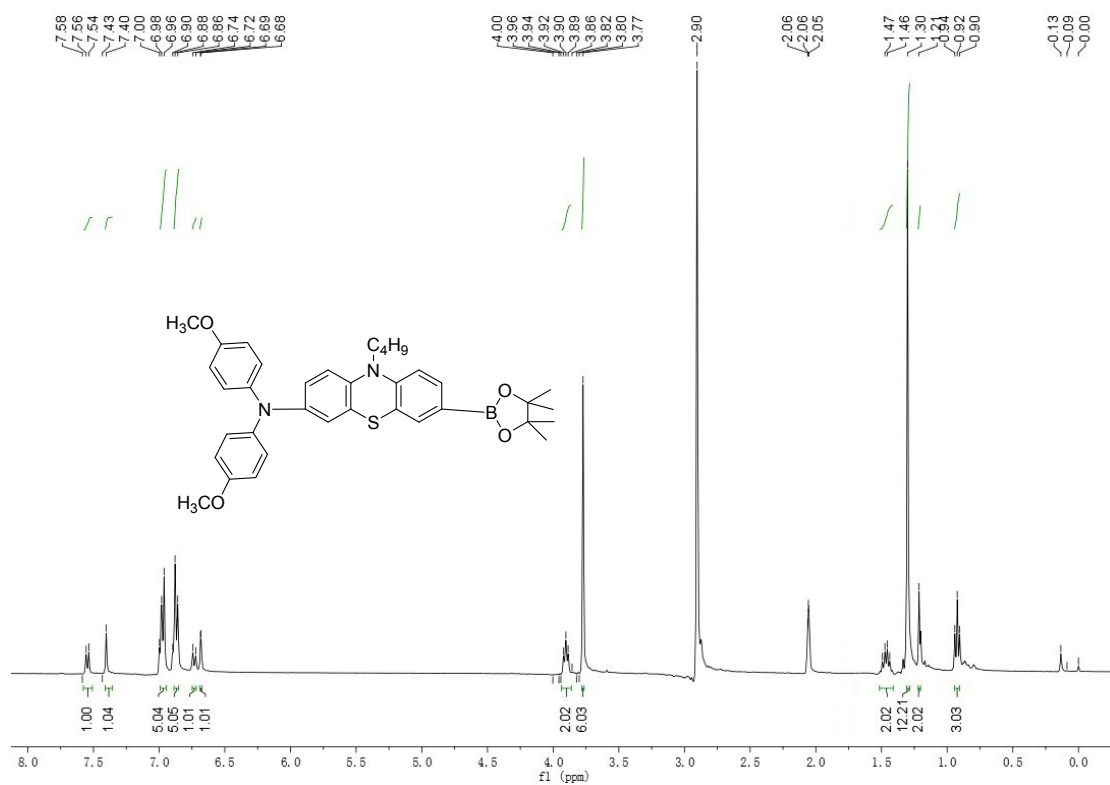


Fig. S15. ¹H NMR of 10-Butyl-N,N-bis(4-methoxyphenyl)-7-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-10H-phenothiazin-3-amine (**10**)

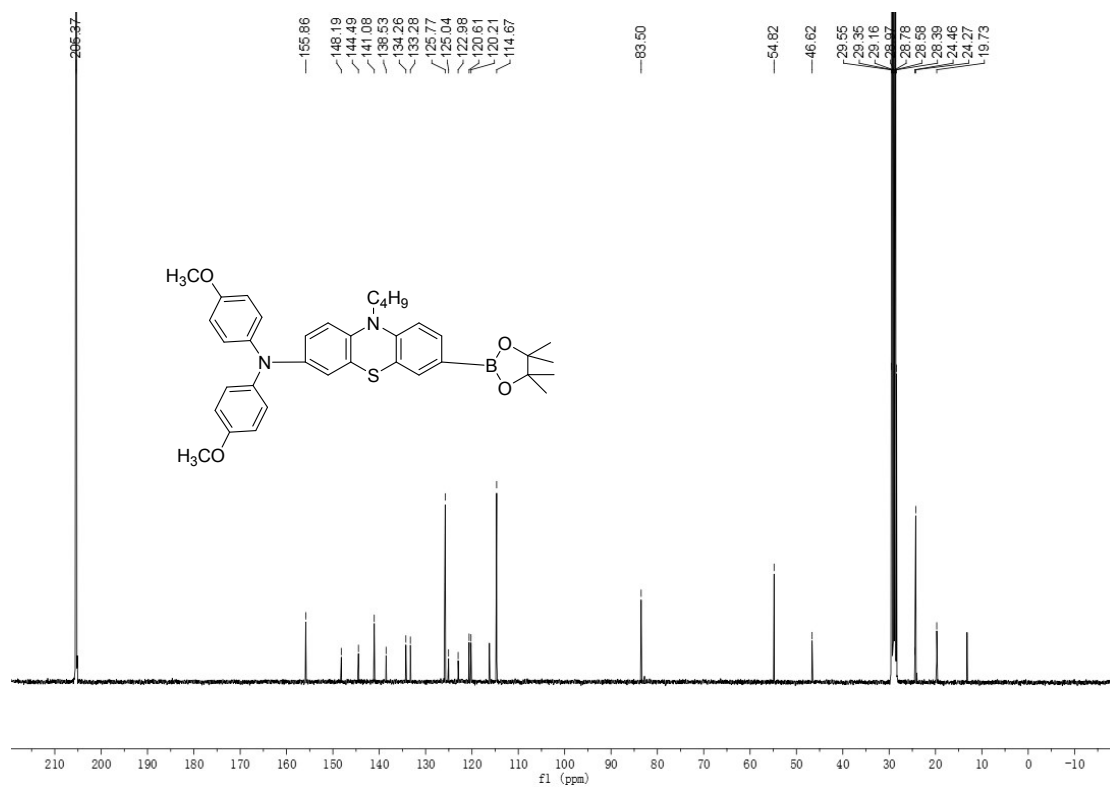


Fig. S16. ¹³C NMR of 10-Butyl-N,N-bis(4-methoxyphenyl)-7-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-10H-phenothiazin-3-amine (**10**)

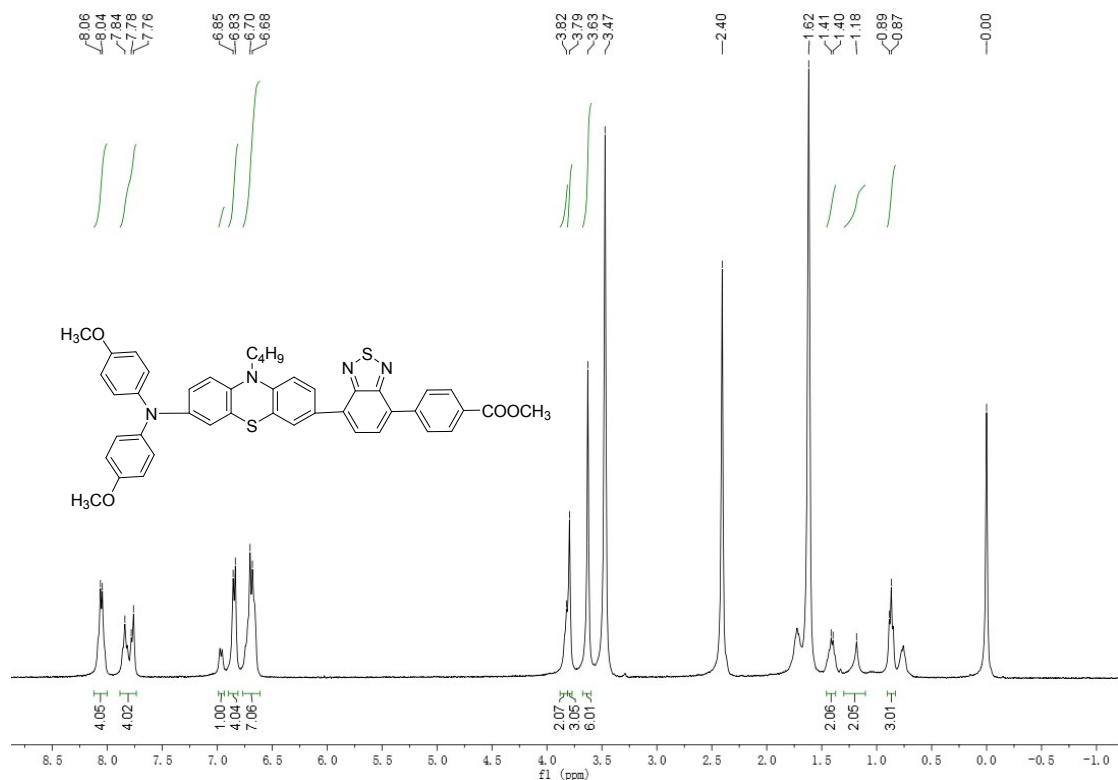


Fig. S17. ¹H NMR of Methyl-4-(7-(7-(bis(4-methoxyphenyl)amino)-10-butyl-10H-phenothiazin-3-yl)benzo[c][1,2,5]thiadiazol-4-yl)benzoate (**13**)

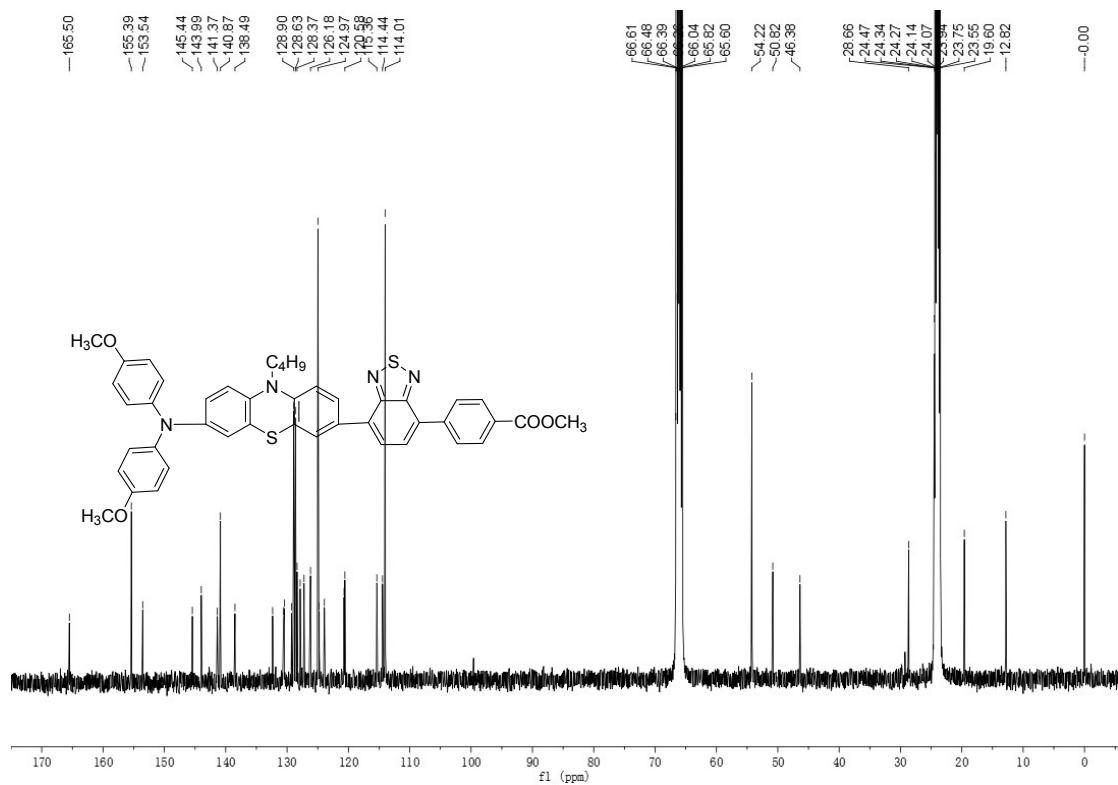
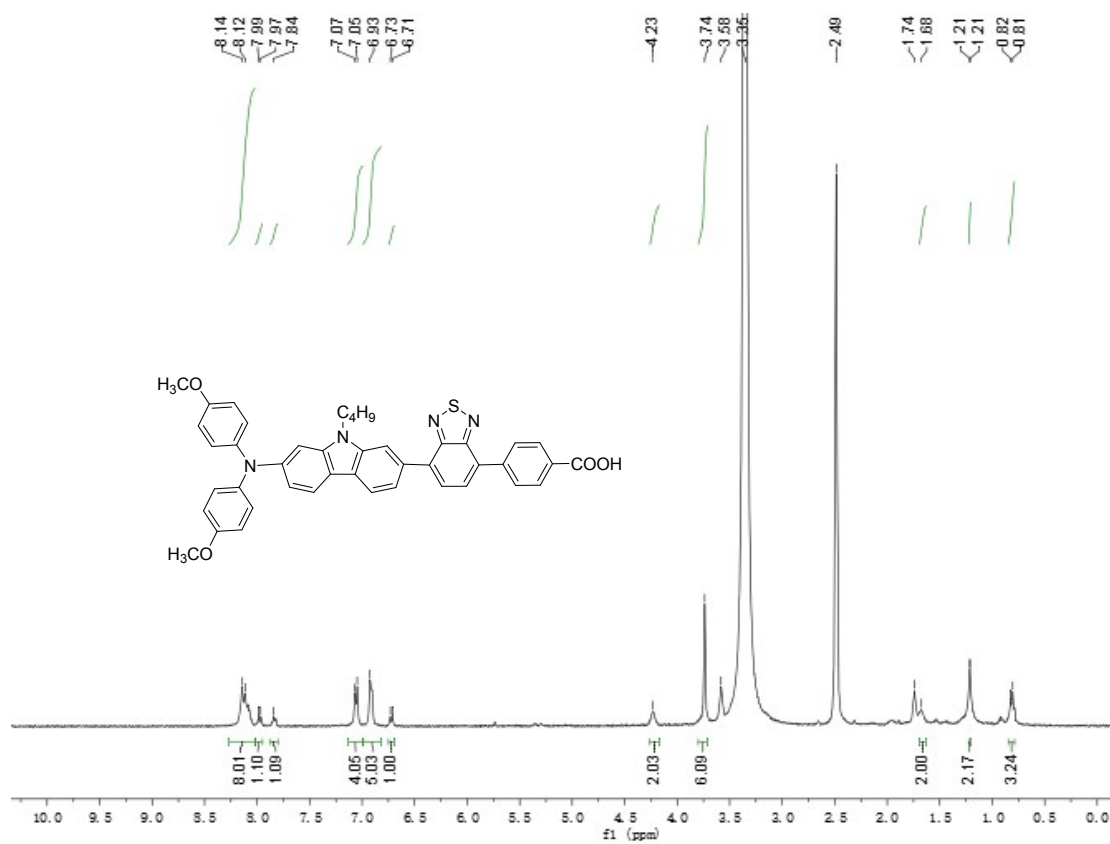
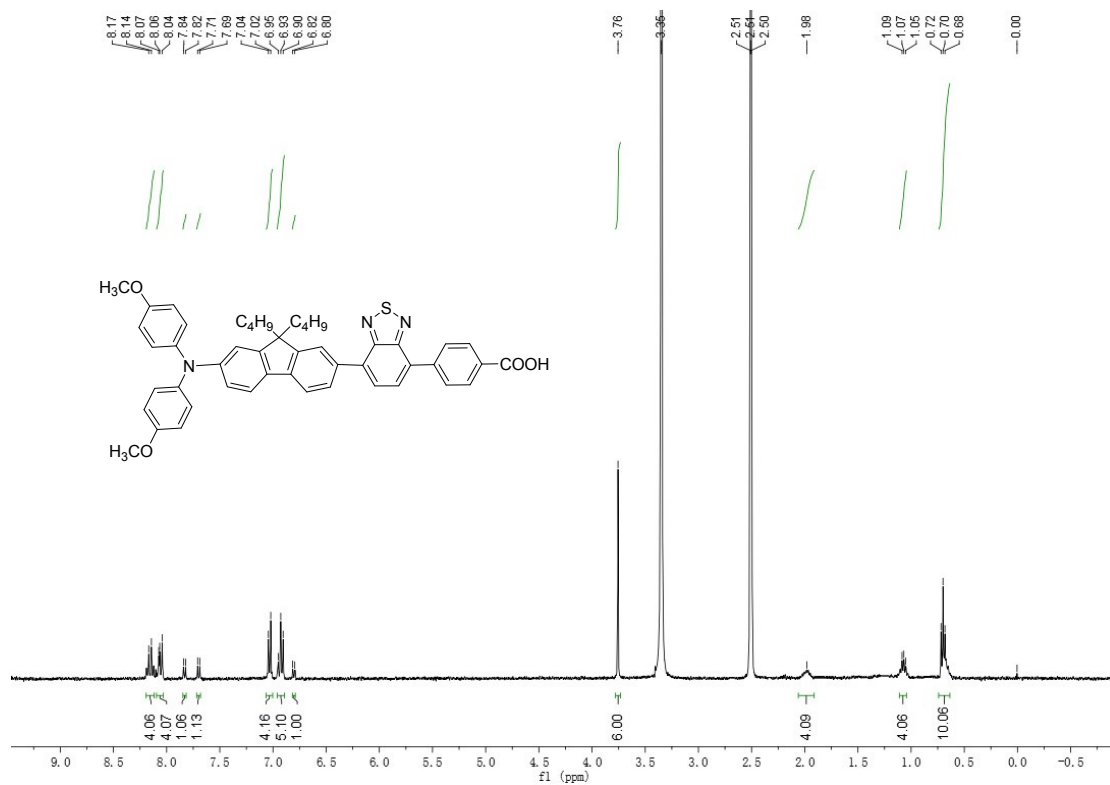


Fig. S18. ¹³C NMR of Methyl-4-(7-(7-(bis(4-methoxyphenyl)amino)-10-butyl-10H-phenothiazin-3-yl)benzo[c][1,2,5]thiadiazol-4-yl)benzoate (**13**)



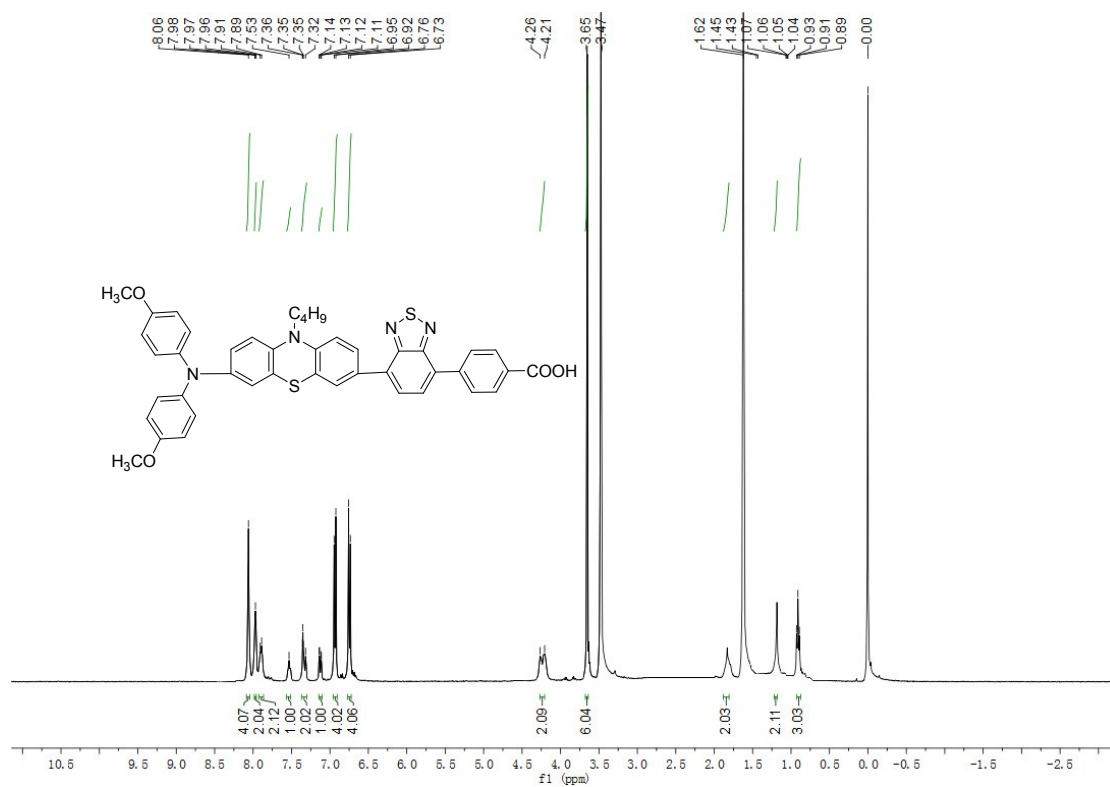


Fig. S21. ¹H NMR of BT6.

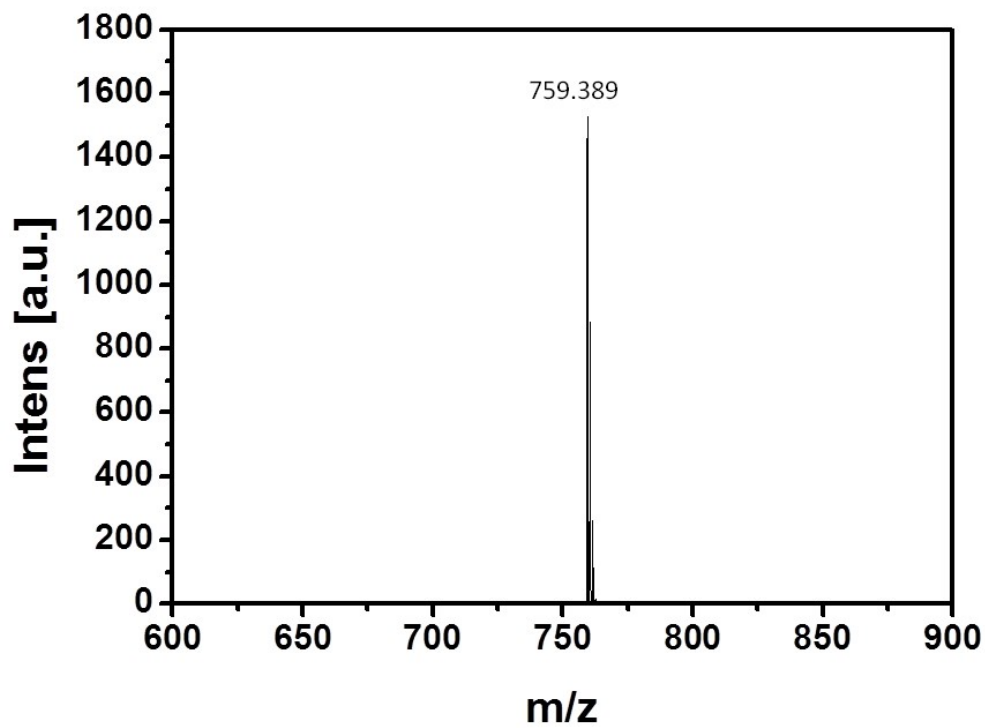


Fig. S22. MALDI-TOF-MS spectrum of compound BT4

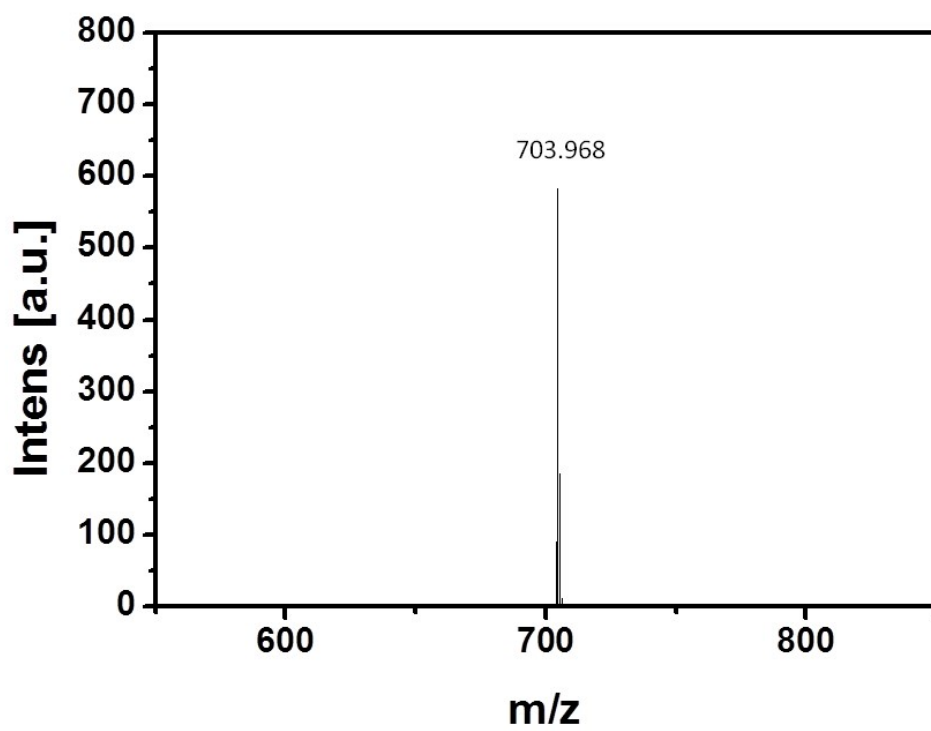


Fig. S23. MALDI-TOF-MS spectrum of compound **BT5**

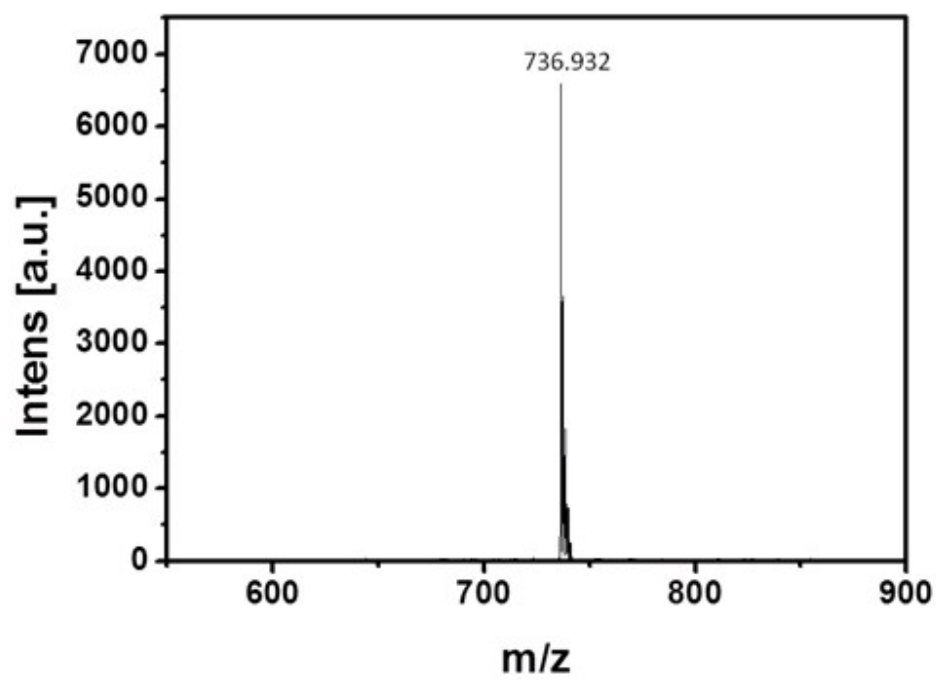


Fig. S24. MALDI-TOF-MS spectrum of compound **BT6**

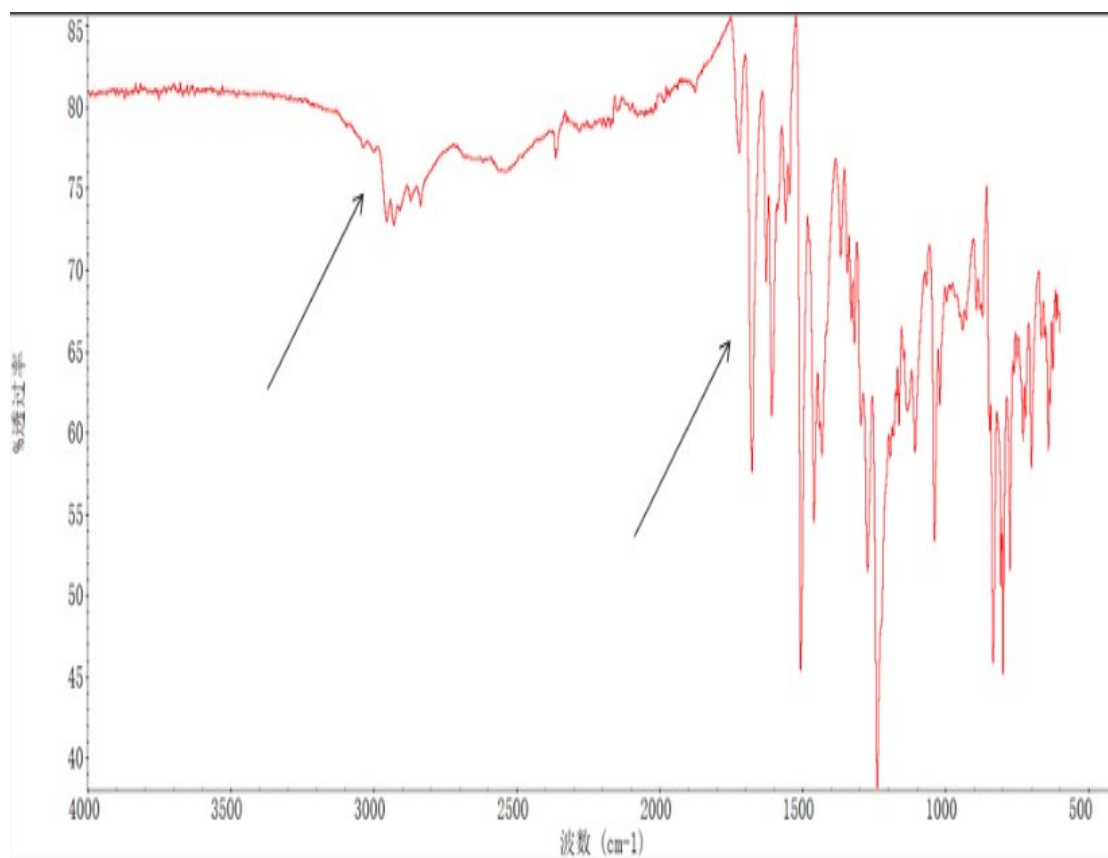


Fig. S25. Infrared spectrum of compound **BT4**

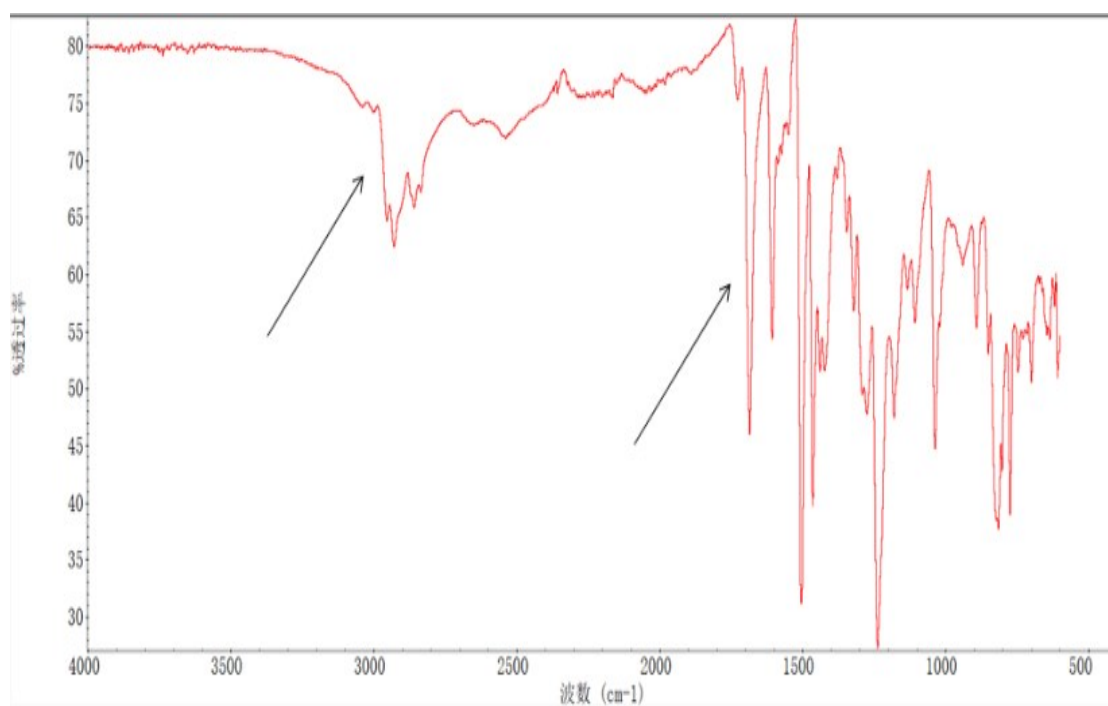


Fig. S26. Infrared spectrum of compound **BT5**

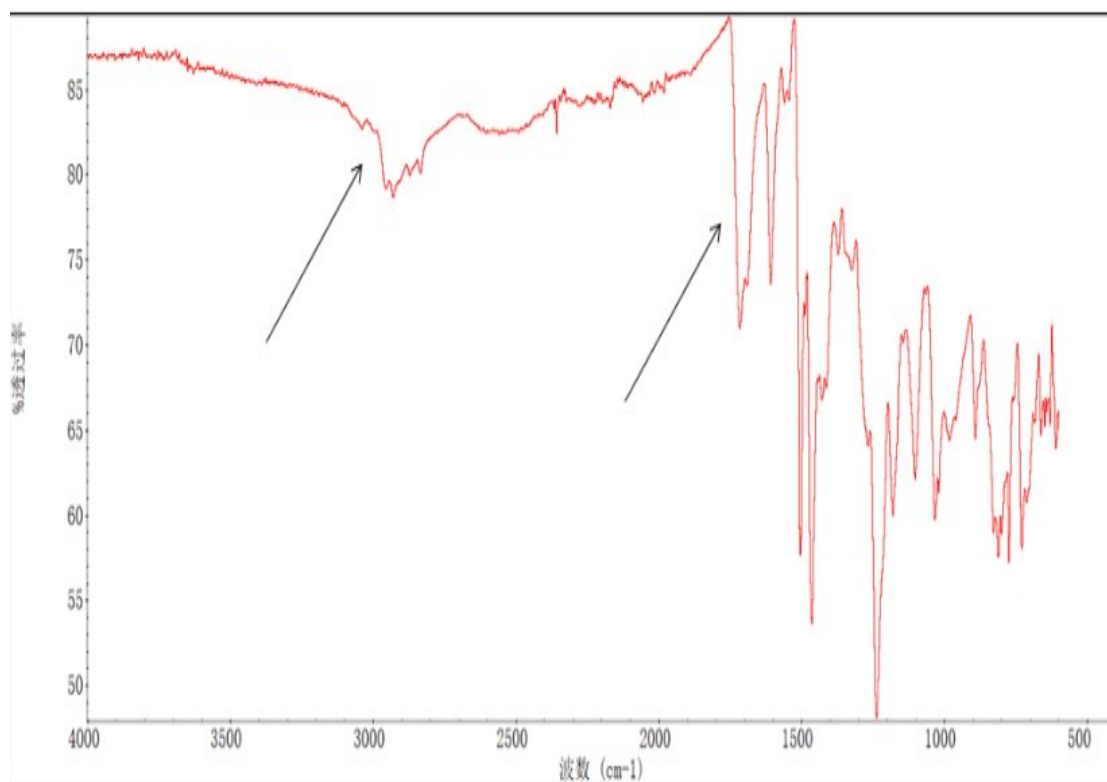


Fig. S27. Infrared spectrum of compound **BT6**