

Iron-Borophosphate Glass-Catalyzed Regioselective Hydrothiolation of Alkynes under Green Conditions

Nicoli Catholico ¹, Eduarda A. Tessari ², Isis J. A. Granja ³, Martinho J. A. de Sousa ⁴,
Jorlandio F. Felix ⁵, Flávia Manarin ², Marcelo Godoi ⁶, Jamal Rafique ^{3,4}, Ricardo Schneider ^{7,*},
Sumbal Saba ^{3,*}, Giancarlo V. Botteselle ^{1,*}

¹ Department of Chemistry, Midwestern Parana State University-UNICENTRO, Guarapuava, PR 85040-167, Brazil

² Center for Engineering and Exact Sciences, Western Parana State University-UNIOESTE, Toledo, PR 85903-000, Brazil

³ Instituto de Química IQ, Universidade Federal de Goiás-UFG, Goiania, GO 74690-900, Brazil

⁴ Institute of Chemistry-INQUI, Federal University of Mato Grosso do Sul-UFMS, Campo Grande, MS 79074-460, Brazil

⁵ Institute of Physics, University of Brasilia-UNB, Brasilia, DF 70910 900, Brazil

⁶ School of Chemistry and Food, Federal University of Rio Grande-FURG, Santo Antonio da Patrulha, RS 95500 000, Brazil

⁷ Group of Polymers and Nanostructures, Federal University of Technology Parana-UTFPR, Toledo, PR 85902 490, Brazil

* Correspondence: rschneider@utfpr.edu.br (R.S.); sumbalsaba@ufg.br (S.S.); giancarlo@unicentro.br (G.V.B.)

Contents

1. Characterization of Iron-borophosphate glass (Fe@NaH₂PO₄-H₃BO₃ glass)
2. ¹H and ¹³C NMR spectra for all compounds

1. Characterization of iron-borophosphate glass

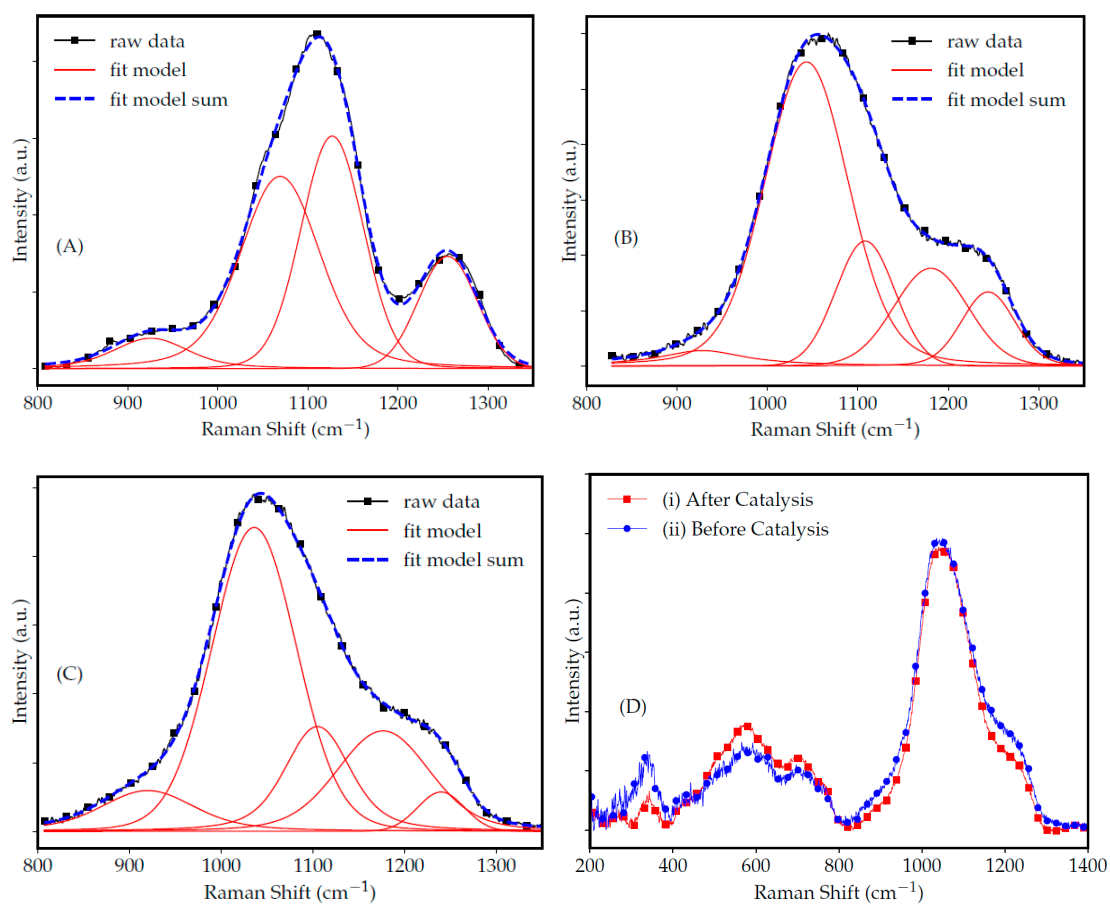
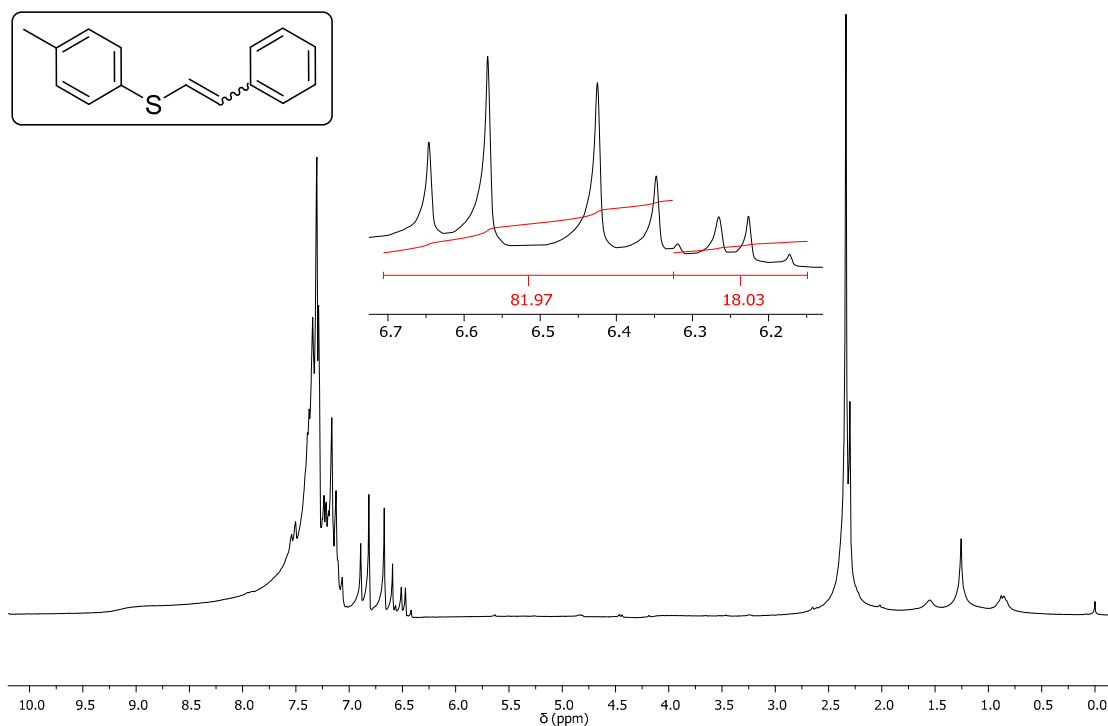


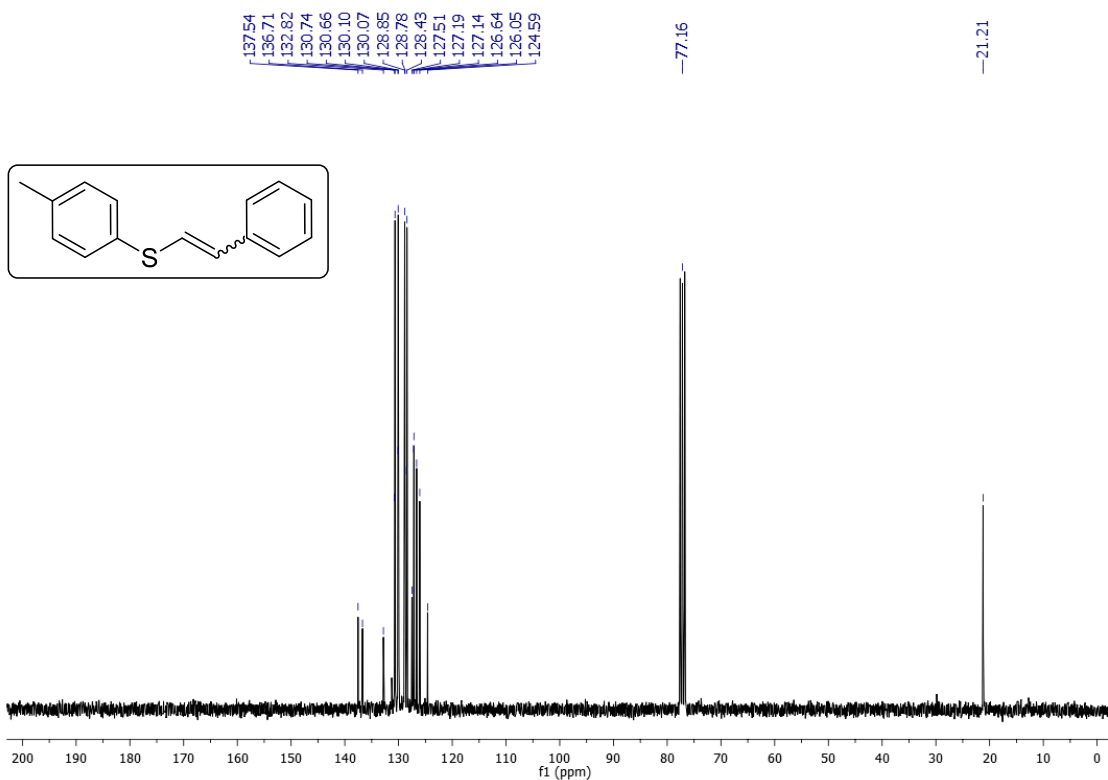
Figure S1. Deconvolution spectra of glasses at the region between 800 and 1350 cm^{-1} with **(A)** 0% Al_2O_3 and 0% Fe_2O_3 , **(B)** 10% Al_2O_3 and 0% Fe_2O_3 , and **(C)** 10% Al_2O_3 , 6% Fe_2O_3 , and **(D)** full Raman spectra of the glass-based catalyst (i) after and (ii) before reaction.

2. ^1H and ^{13}C NMR spectra for all compounds

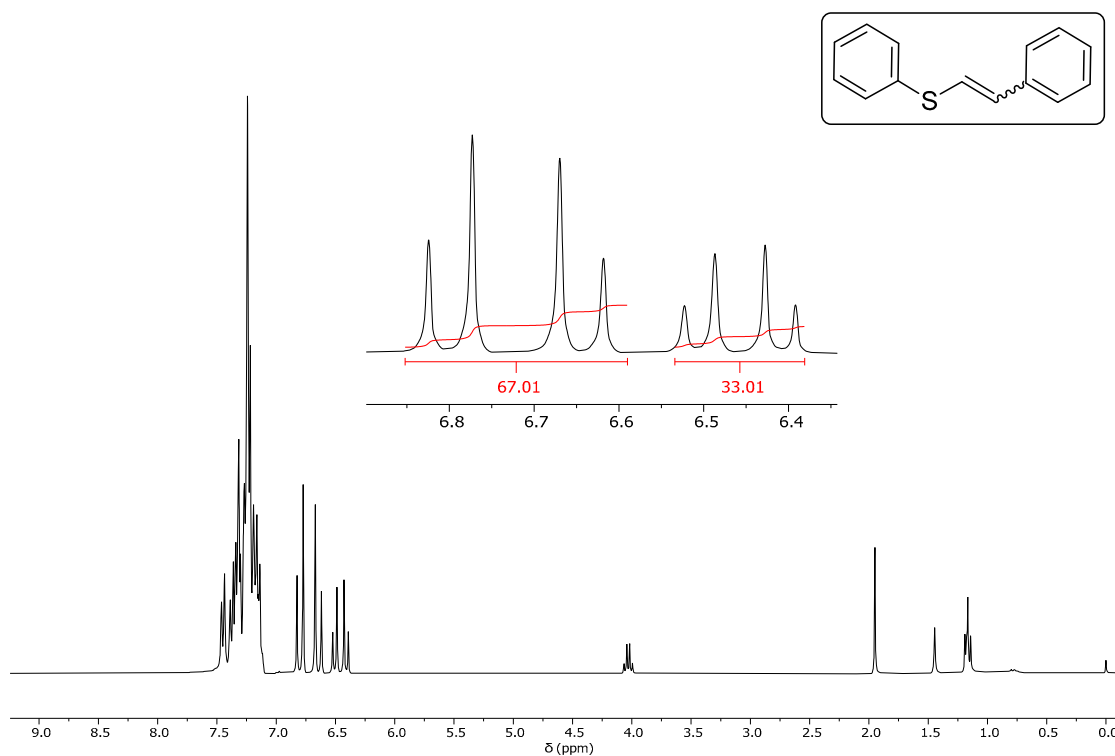
^1H NMR spectrum of compound **3a** in CDCl_3 (300 MHz)



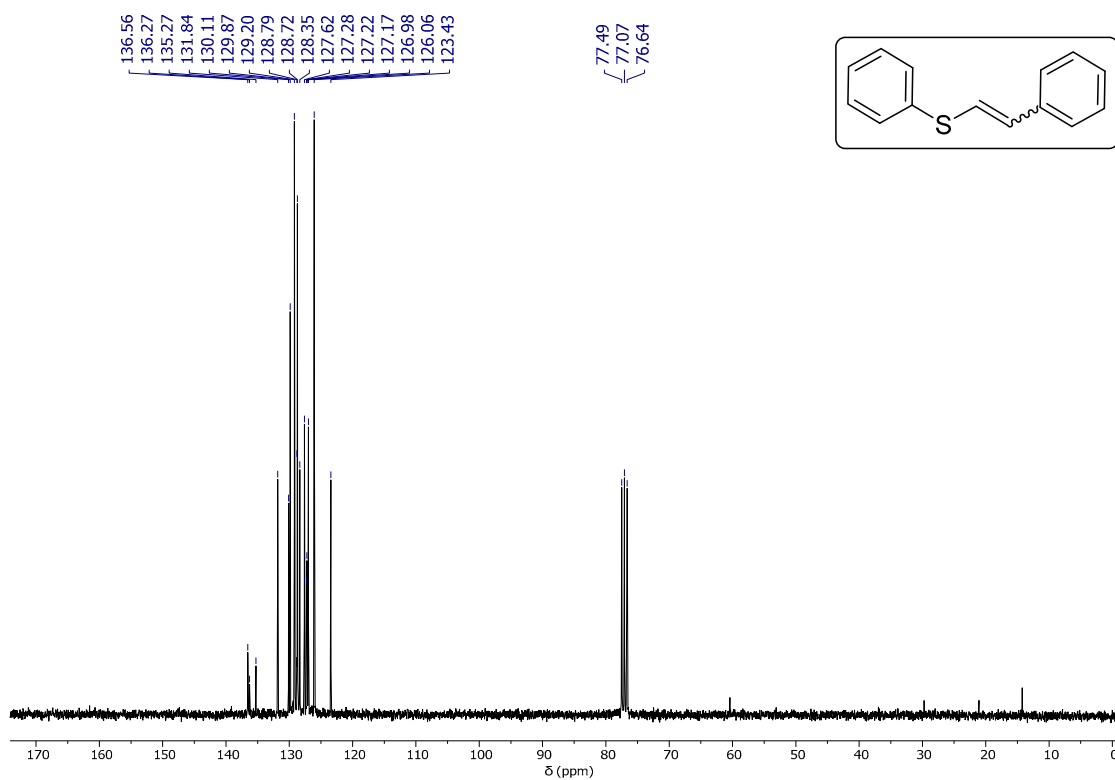
^{13}C NMR spectrum of compound **3a** in CDCl_3 (75 MHz)



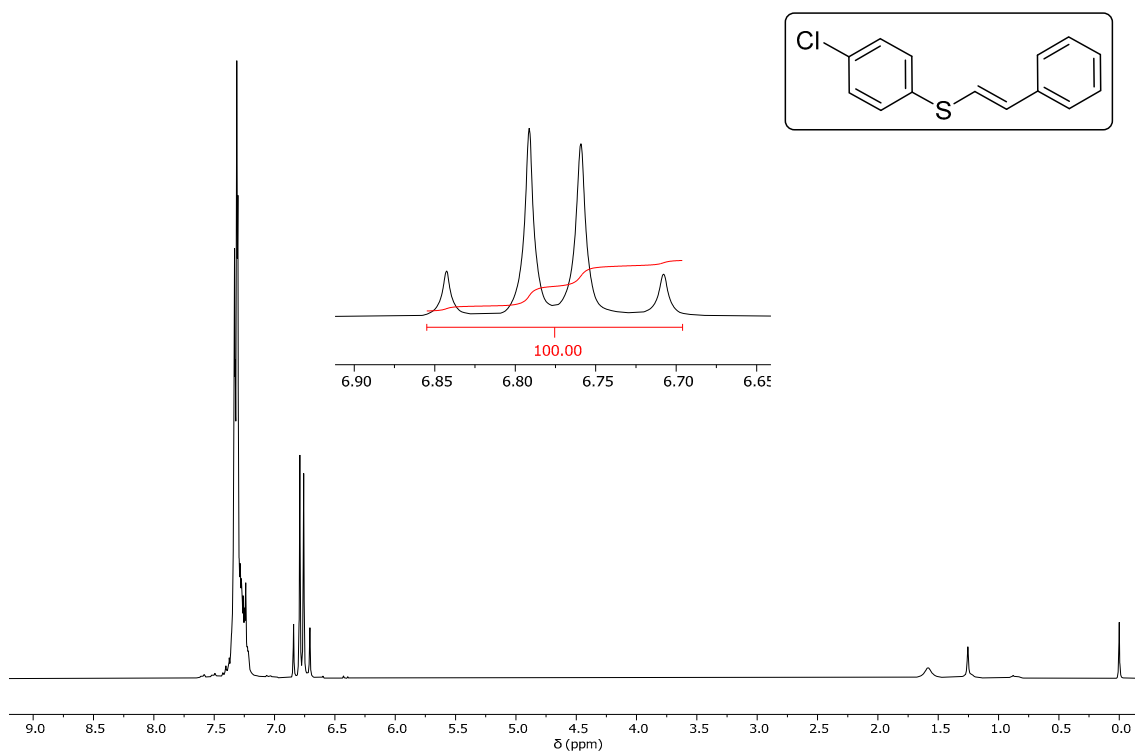
^1H NMR spectrum of compound **3b** in CDCl_3 (300 MHz)



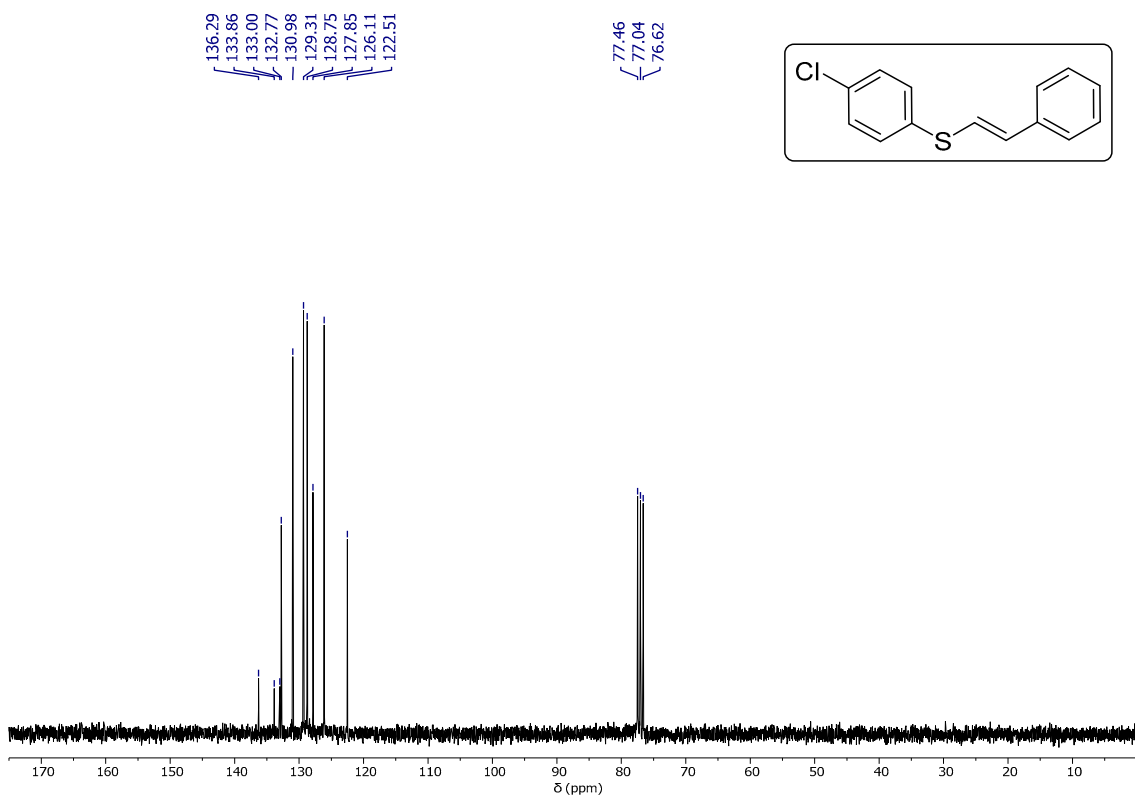
^{13}C NMR spectrum of compound **3b** in CDCl_3 (75 MHz)



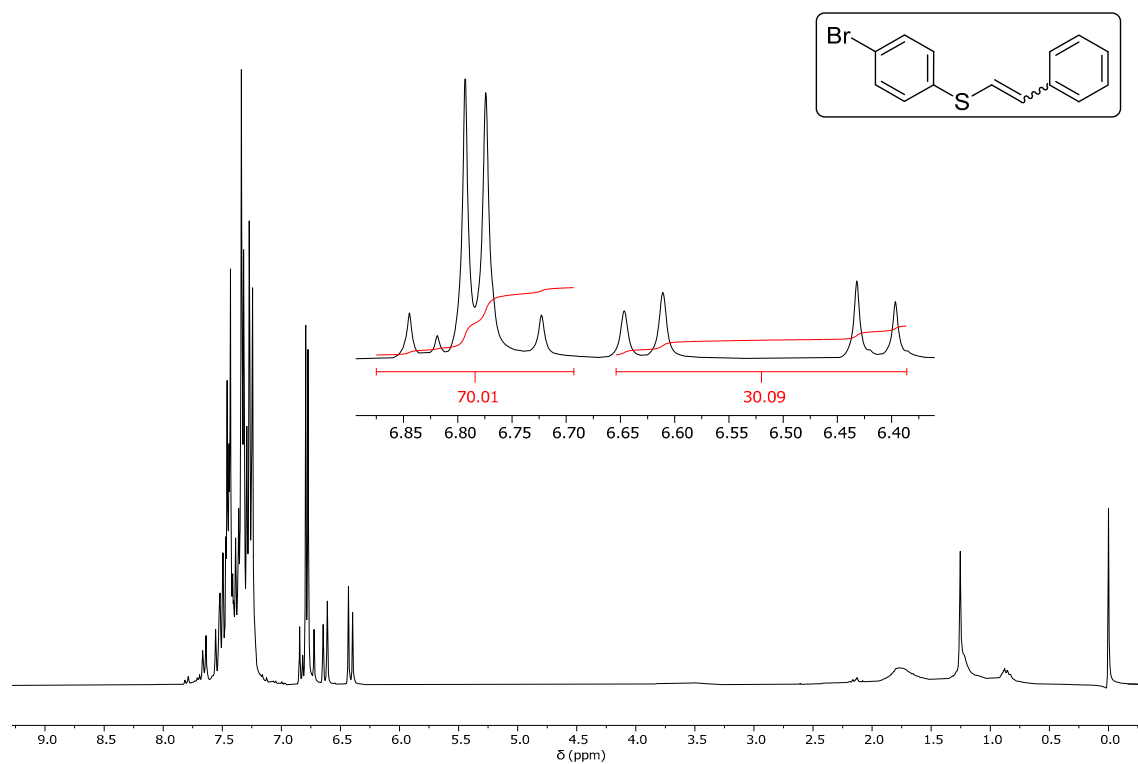
^1H NMR spectrum of compound **3c** in CDCl_3 (300 MHz)



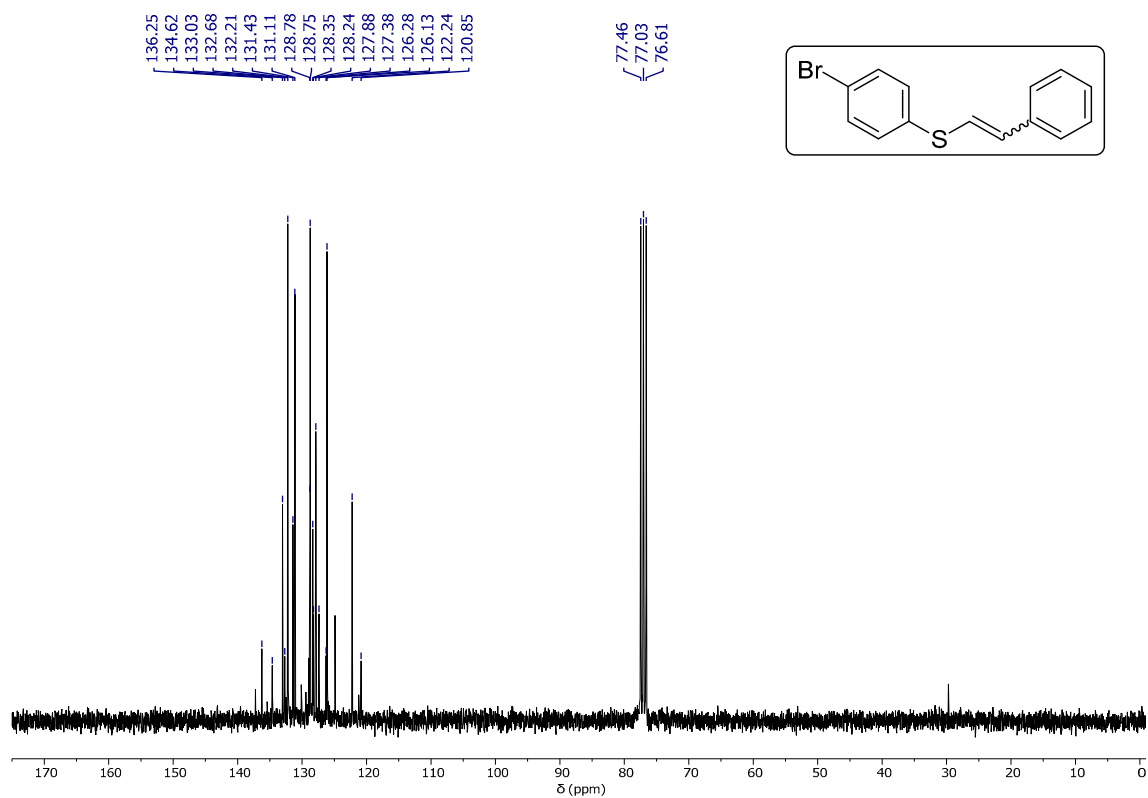
^{13}C NMR spectrum of compound **3c** in CDCl_3 (75 MHz)



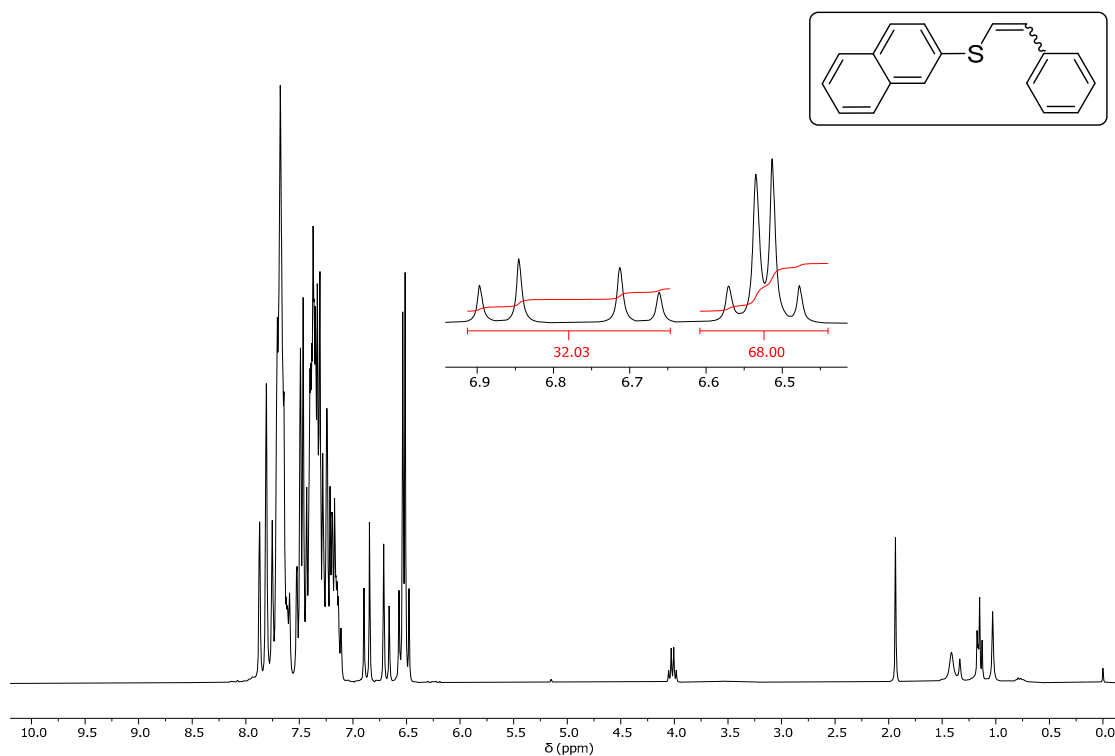
^1H NMR spectrum of compound **3d** in CDCl_3 (300 MHz)



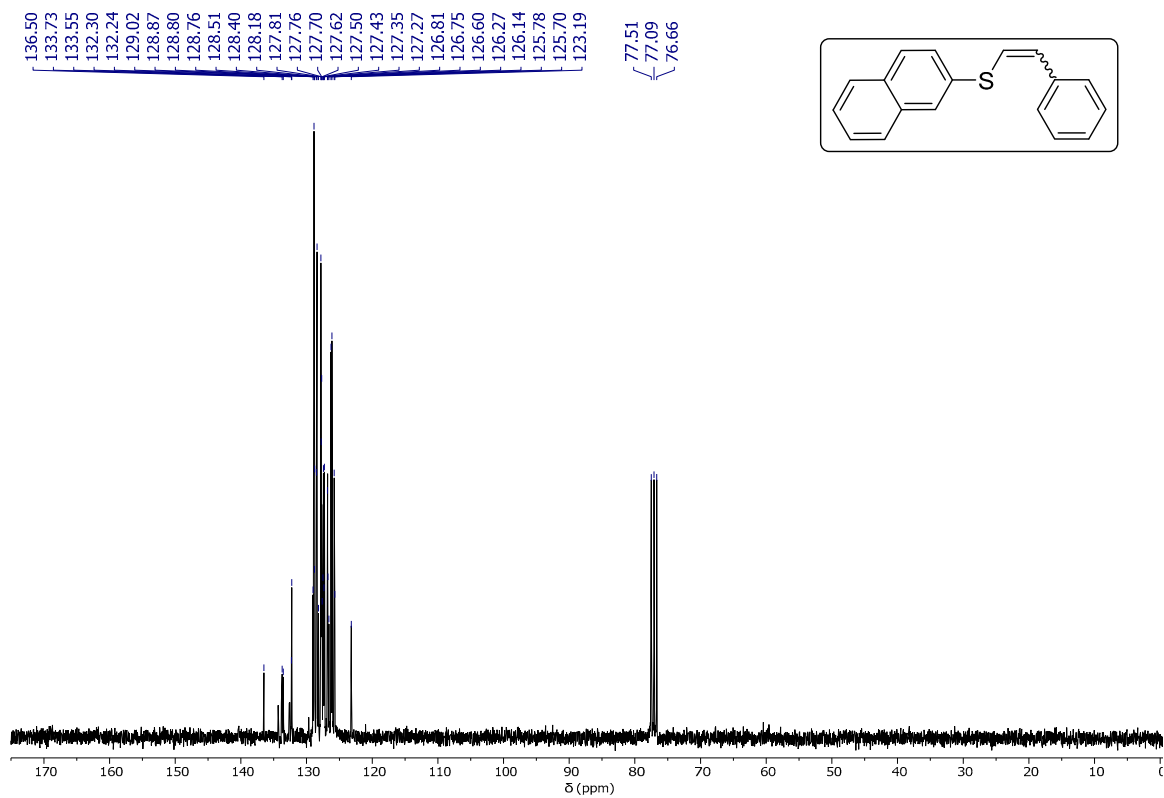
^{13}C NMR spectrum of compound **3d** in CDCl_3 (75 MHz)



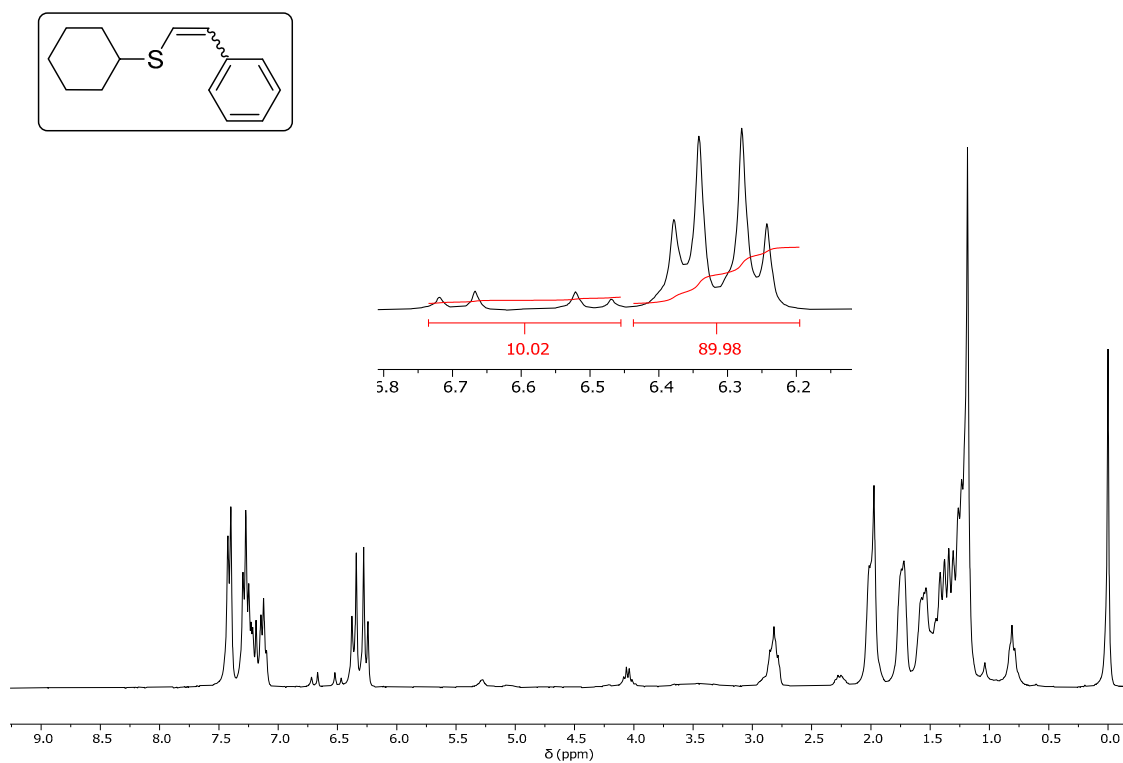
^1H NMR spectrum of compound **3e** in CDCl_3 (300 MHz)



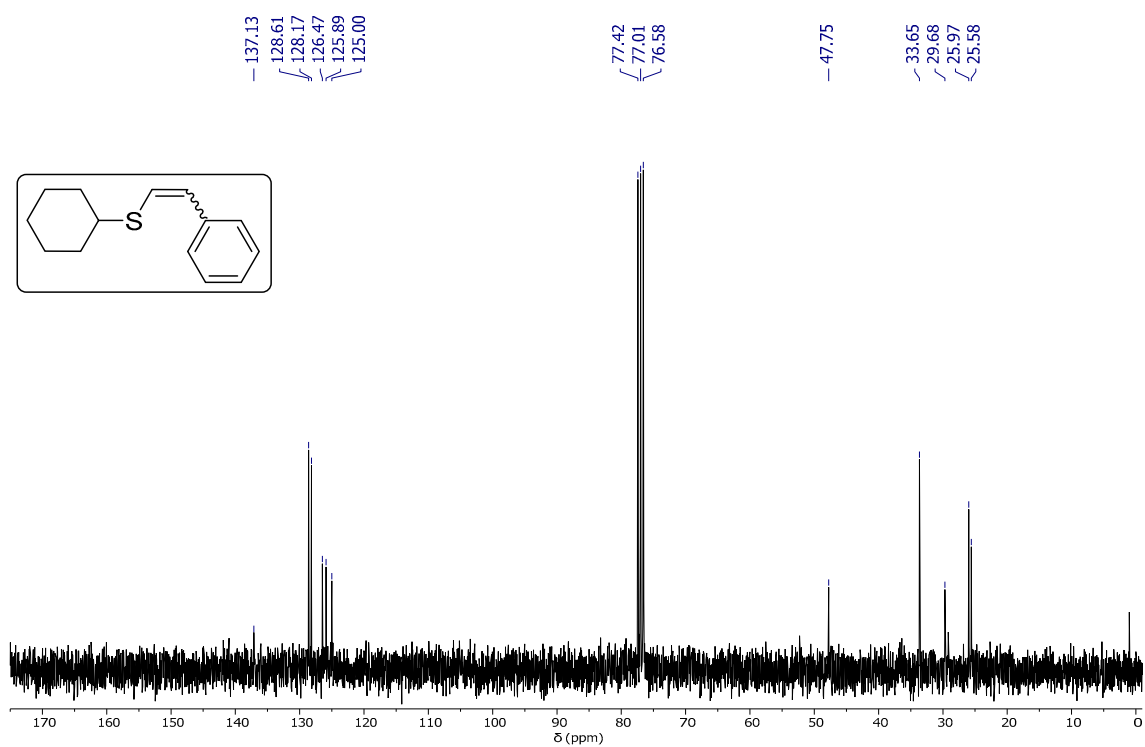
^{13}C NMR spectrum of compound **3e** in CDCl_3 (75 MHz)



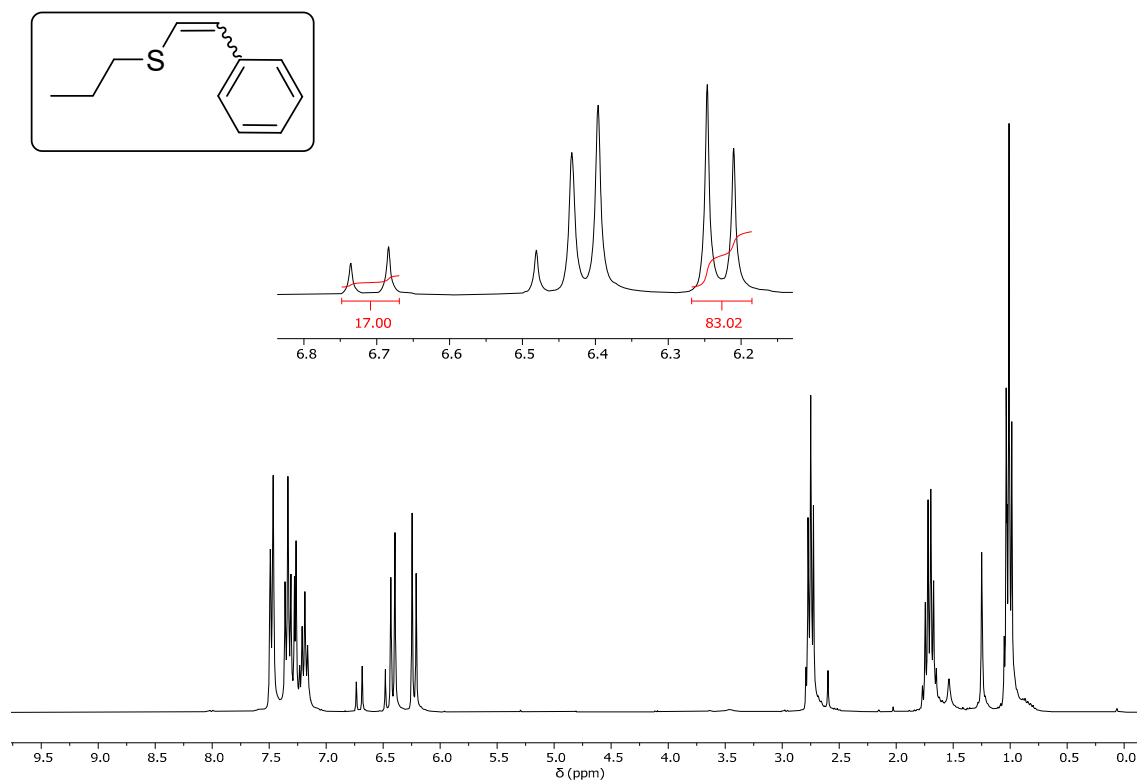
^1H NMR spectrum of compound **3f** in CDCl_3 (300 MHz)



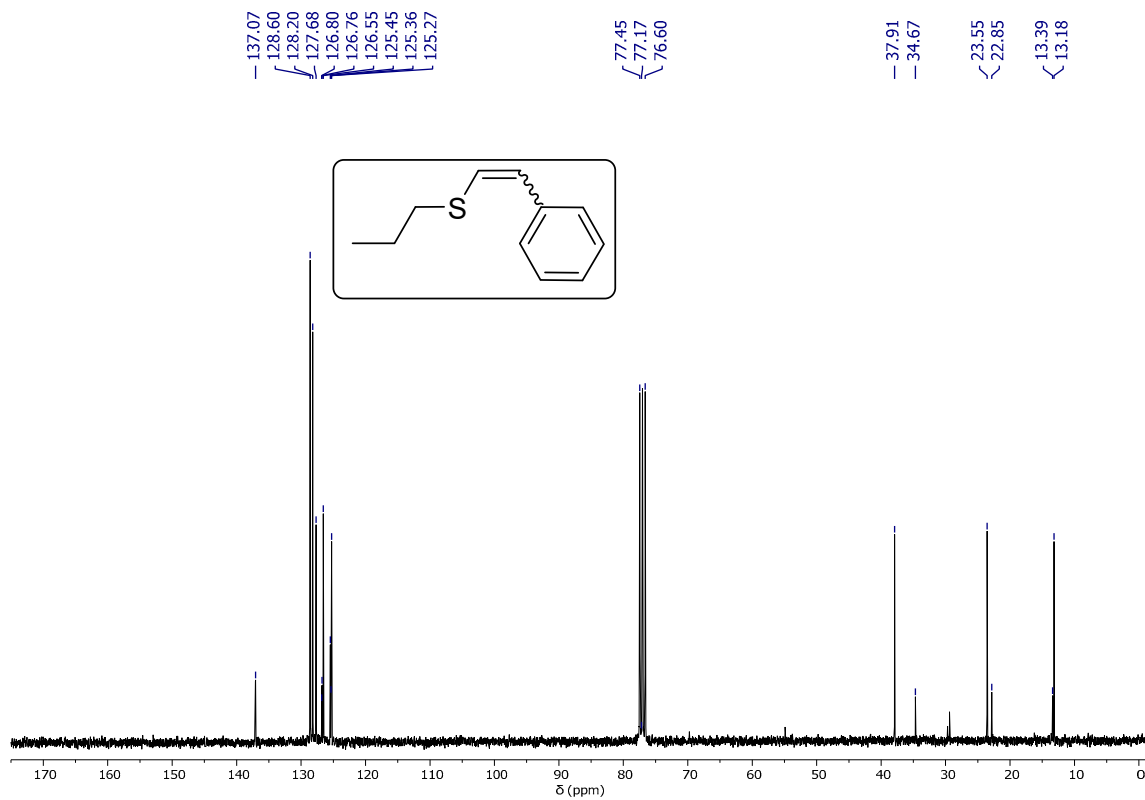
^{13}C NMR spectrum of compound **3f** in CDCl_3 (75 MHz)



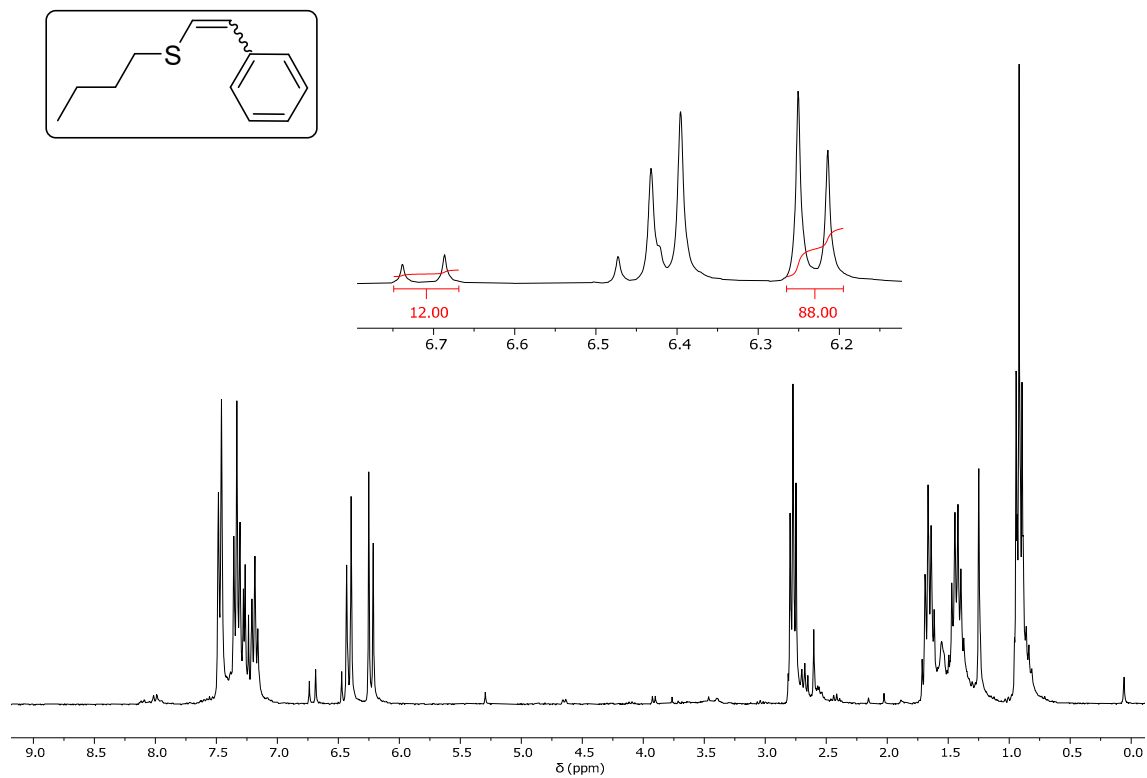
^1H NMR spectrum of compound **3g** in CDCl_3 (300 MHz)



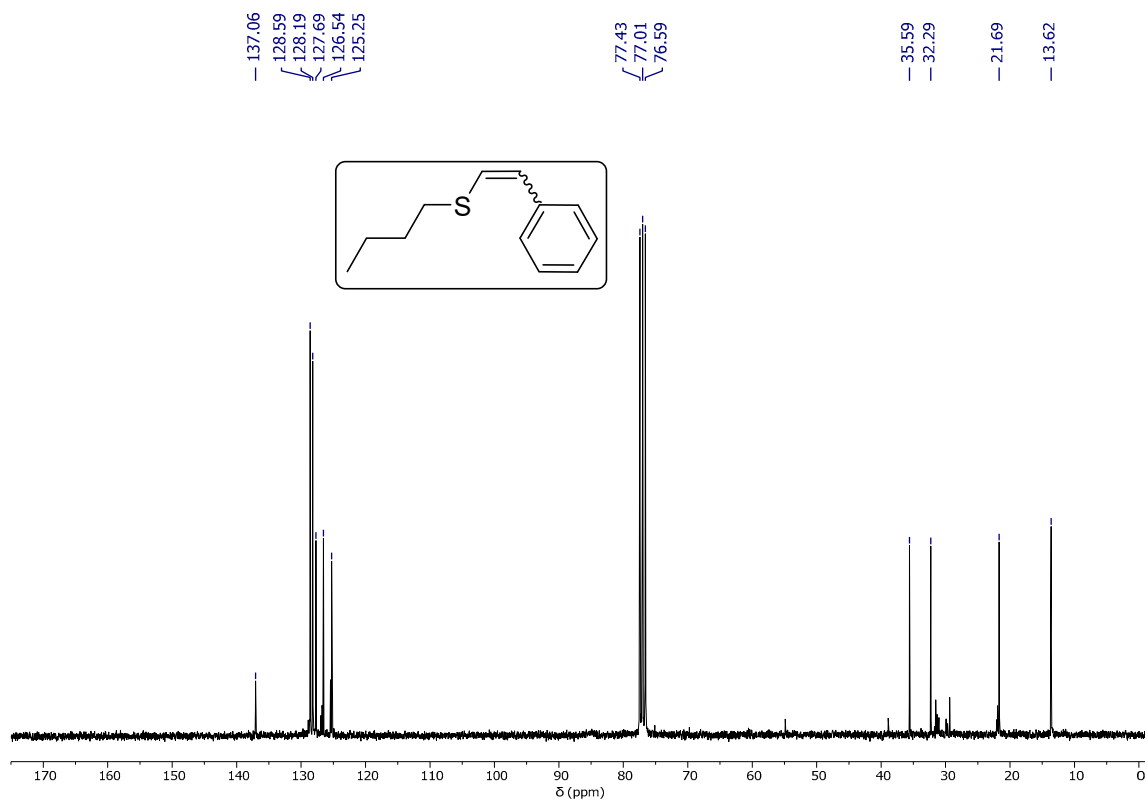
^{13}C NMR spectrum of compound **3g** in CDCl_3 (75 MHz)



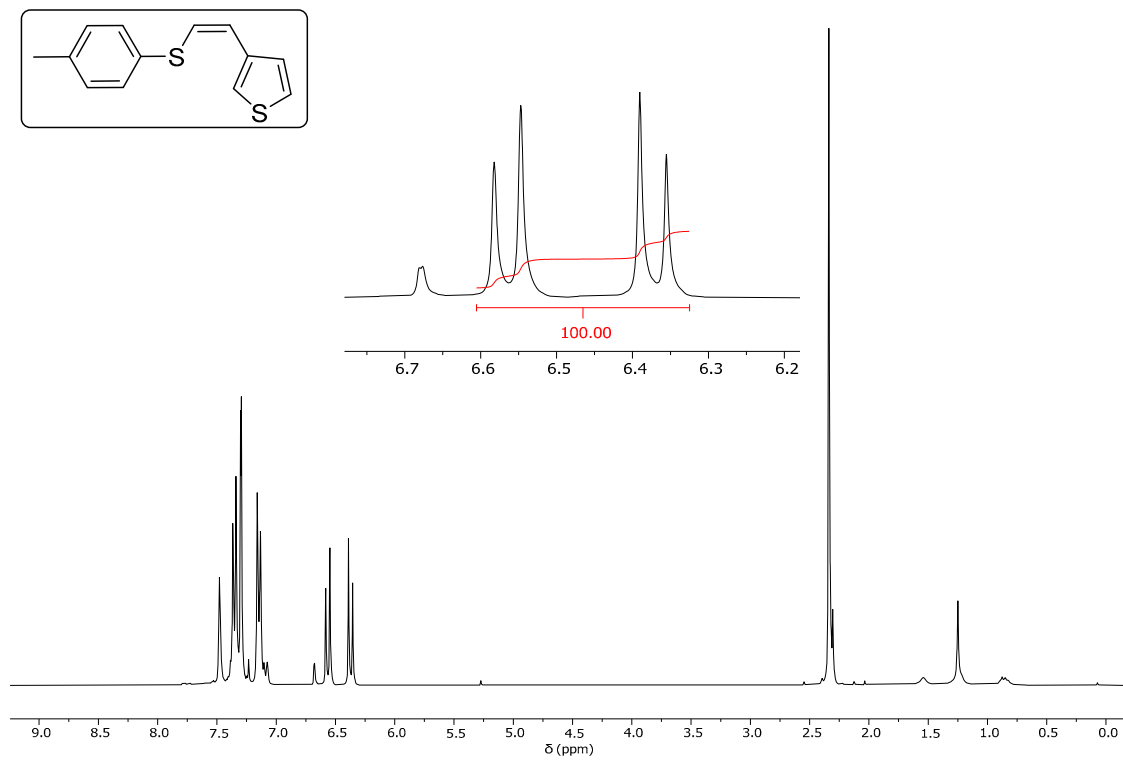
^1H NMR spectrum of compound **3h** in CDCl_3 (300 MHz)



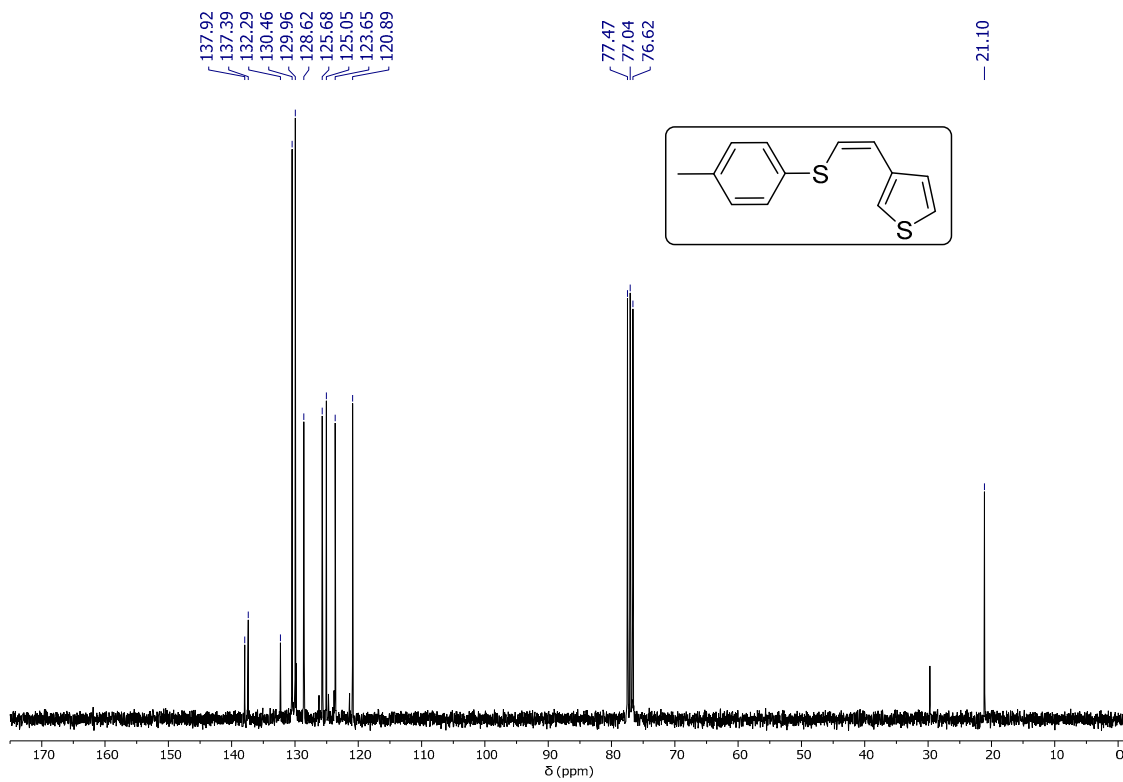
^{13}C NMR spectrum of compound **3h** in CDCl_3 (75 MHz)



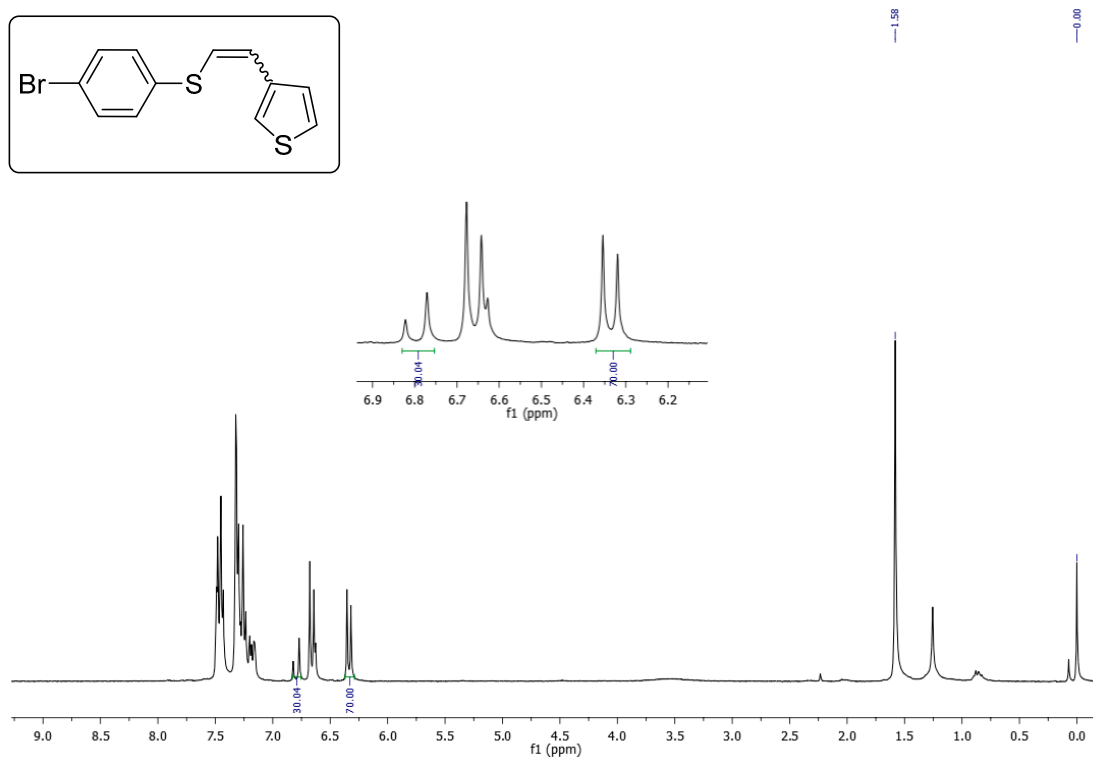
^1H NMR spectrum of compound **3i** in CDCl_3 (300 MHz)



^{13}C NMR spectrum of compound **3i** in CDCl_3 (75 MHz)



^1H NMR spectrum of compound **3j** in CDCl_3 (300 MHz)



^{13}C NMR spectrum of compound **3j** in CDCl_3 (75 MHz)

