

Using Chiral Ionic Liquid additives to Enhance asymmetric induction in a Diels-Alder reaction

P. Goodrich,^{*,a} H.Q. Nimal Gunaratne,^a L. Hall,^a Y. Wang,^a L. Jin,^b M.J. Muldoon,^{*,a} A.P.C. Ribeiro,^c A.J.L. Pombeiro,^c V.I. Pârvulescu,^d P. Davey,^e C. Hardacre^{*,a,f}

^a*School of Chemistry and Chemical Engineering/QUILL, Queen's University, Stranmillis Road, Belfast, Northern Ireland BT9 5AG, UK (p.goodrich@qub.ac.uk; m.j.muldoon@qub.ac.uk).*

^b*School of Science, China Pharmaceutical University, Nanjing, 210009, P. R. China.*

^c*Centro de Química Estrutural, Complexo I, Instituto Superior Técnico, Universidade de Lisboa, Av. Rovisco Pais 1049-001 Lisboa, Portugal.*

^d*University of Bucharest, Department of Chemical Technology and Catalysis, B-dul Regina Elisabeta 4-12, Bucharest 030016, Romania.*

^e*Givaudan, Schweiz AG, Überlandstrasse 138, CH-8600 Dübendorf, Switzerland.*

^f*School of Chemical Engineering and Analytical Science, The University of Manchester, Sackville Street, Manchester, M13 9PL, UK (c.hardacre@manchester.ac.uk).*

Figure S1: Synthesis of Chiral cation ionic liquids CILs 1-3

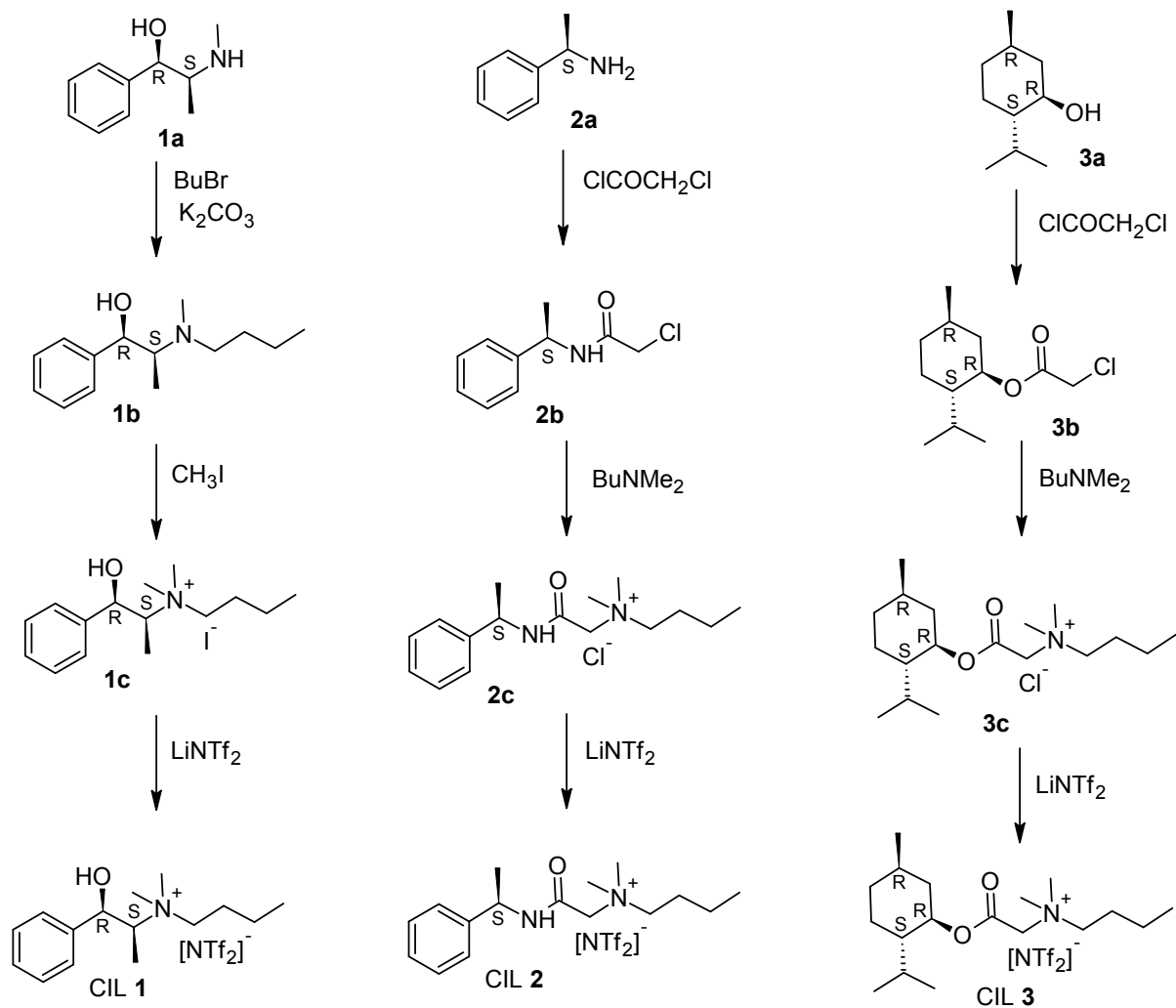


Figure S2: $^1\text{H-NMR}$ spectra of $(1R,2S)$ -1-(-)-(phenylhydroxyethyl)dimethylbutylammonium bis(trifluoromethylsulfonyl)imide (CIL 1)

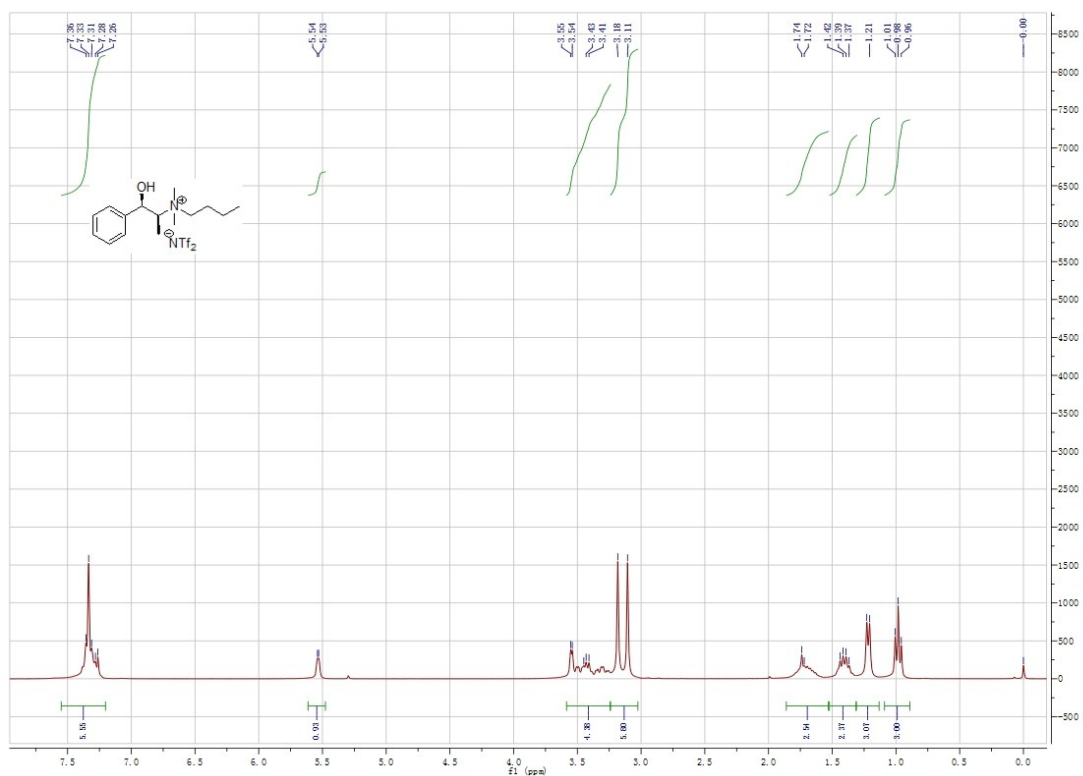


Figure S3: $^{13}\text{C-NMR}$ spectra of $(1R,2S)$ -1-(-)-(phenylhydroxyethyl)dimethylbutylammonium bis(trifluoromethylsulfonyl)imide (CIL 1)

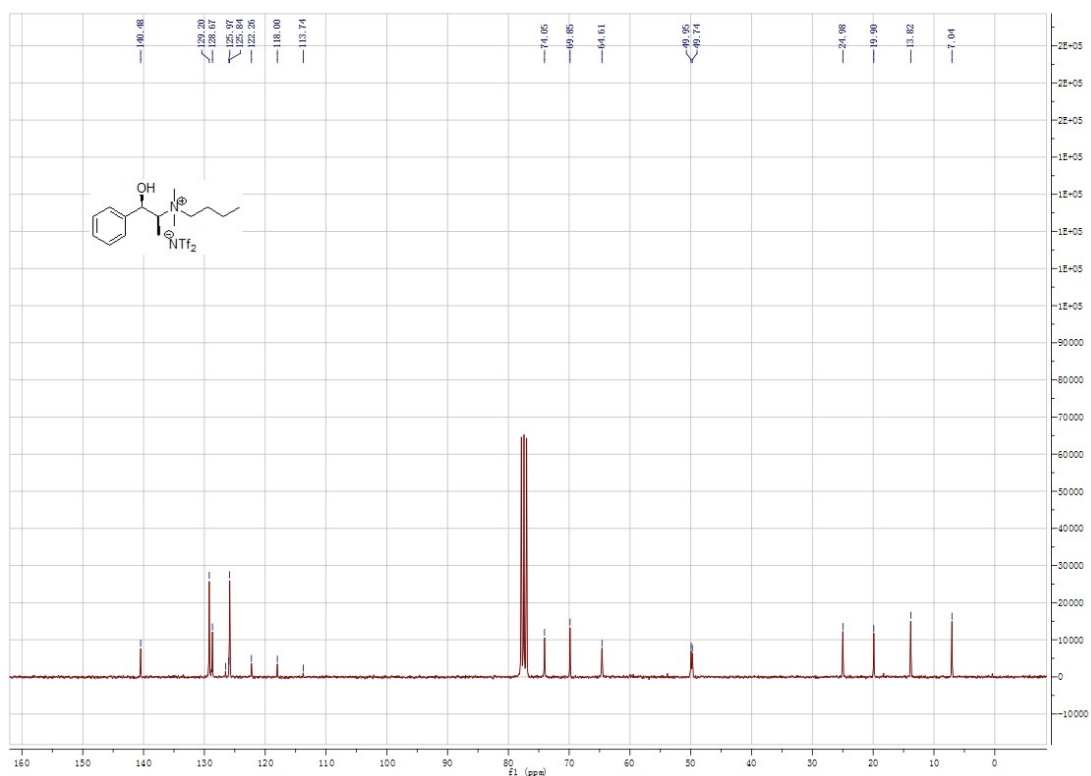


Figure S4: $^1\text{H-NMR}$ spectra of *(1S)-1-(-)-(N-methylphenylacetyl)dimethylbutylammonium bis(trifluoromethylsulfonyl)imide* (CIL 2 S)

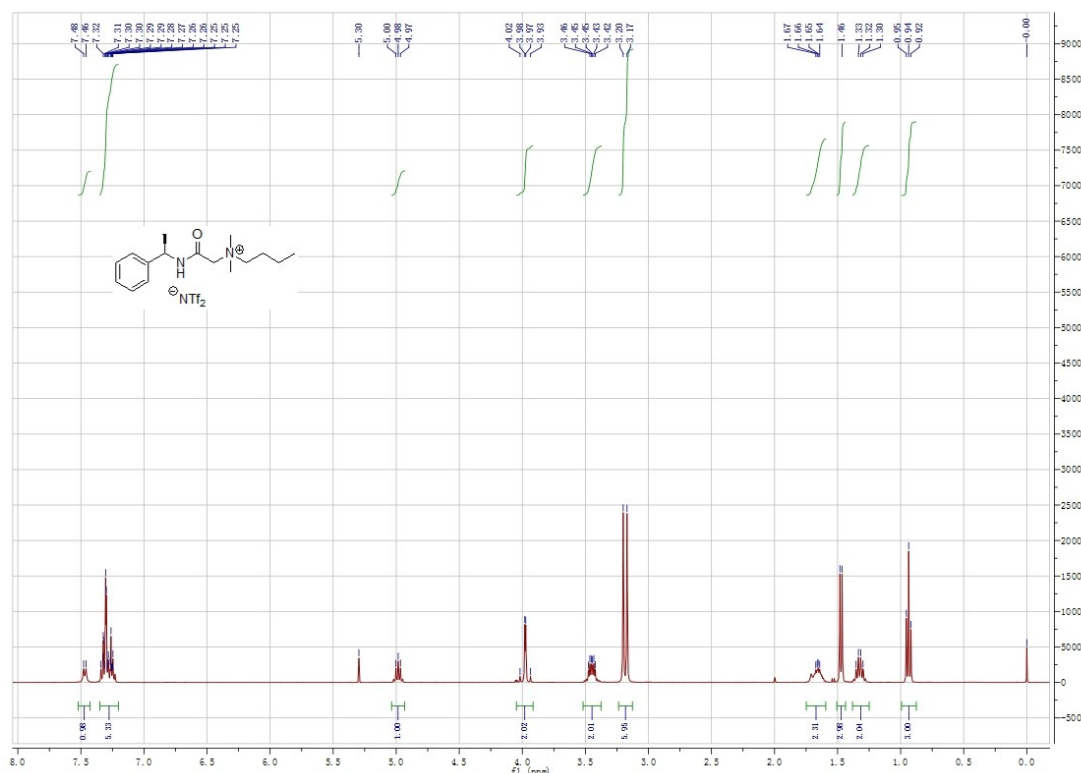


Figure S5: $^{13}\text{C-NMR}$ spectra of *(1S)-1-(-)-(N-methylphenylacetyl)dimethylbutylammonium bis(trifluoromethylsulfonyl)imide* (CIL 2)

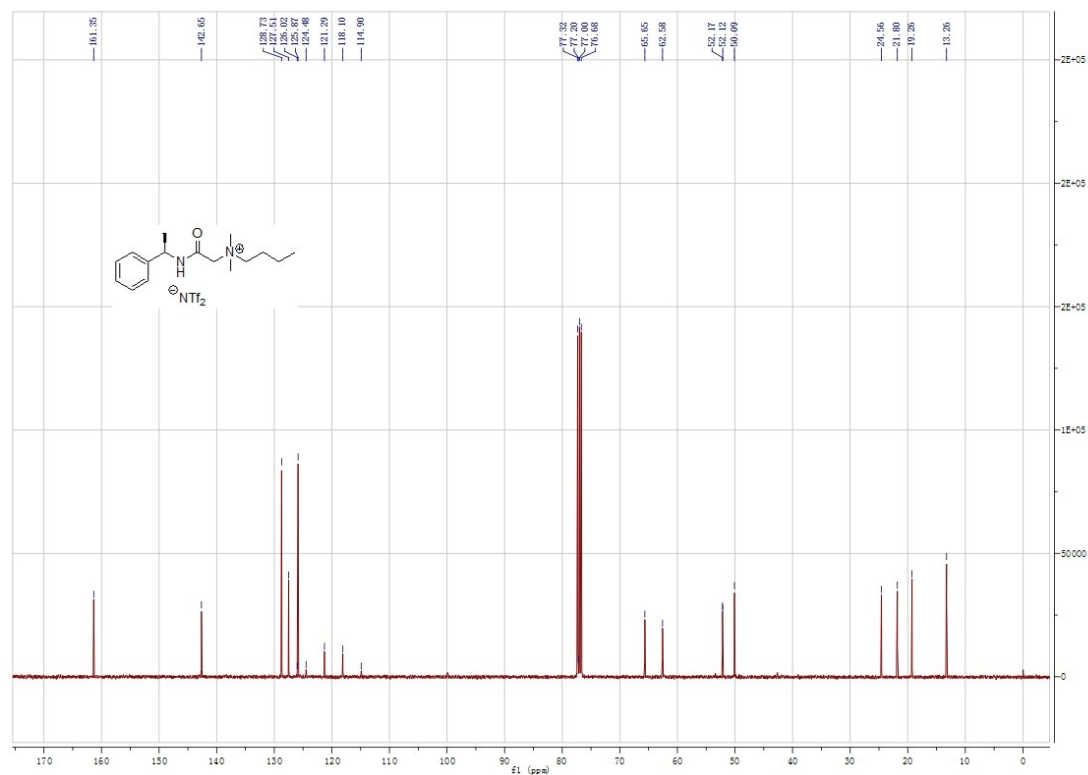


Figure S6: $^1\text{H-NMR}$ spectra of *(1R)-1-(-)-(N-methylphenylacetyl)dimethylbutylammonium bis(trifluoromethylsulfonyl)imide* (CIL 2 R)

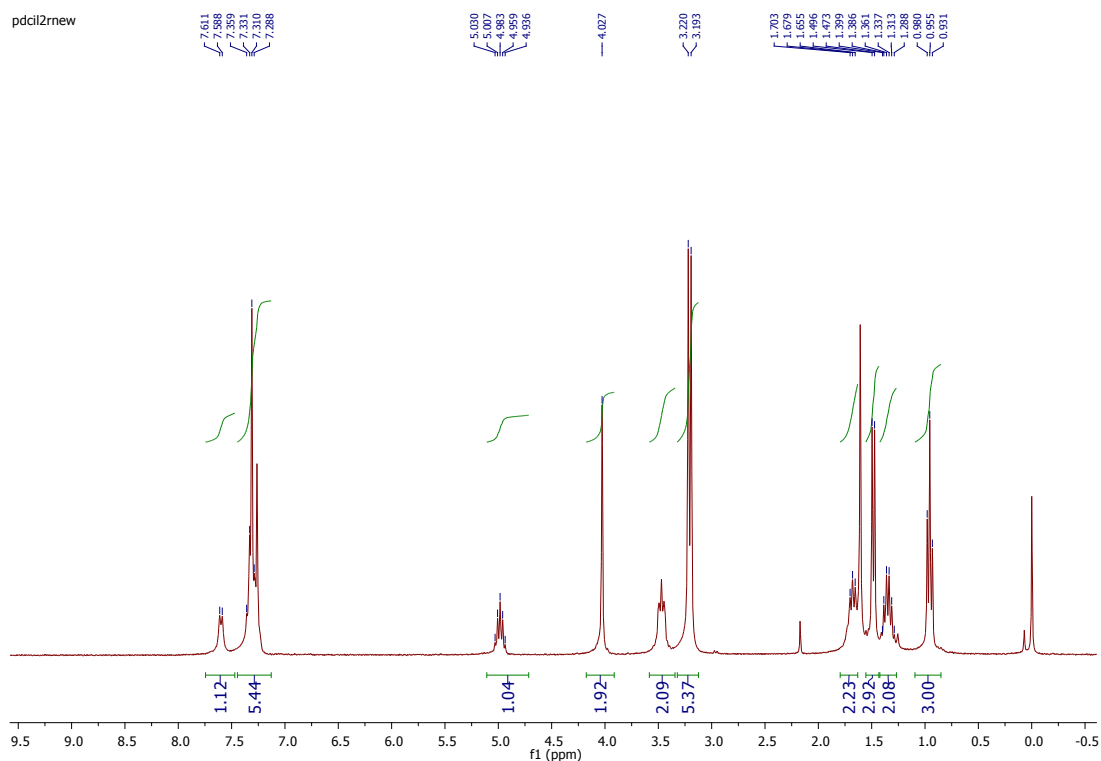


Figure S7: $^1\text{H-NMR}$ spectra of *(1R,2S,5R)-1-(-)-(menthylacetyl)dimethyl-butylammonium bis(trifluoromethylsulfonyl)imide* (CIL 3)

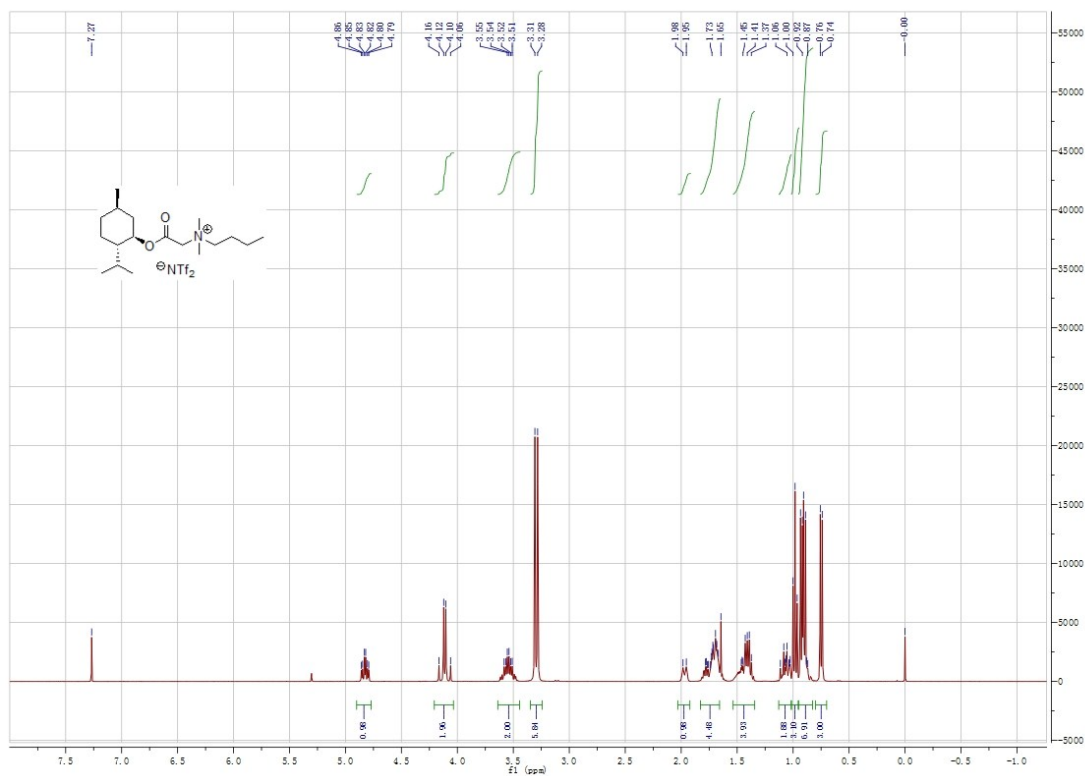


Figure S8: ^{13}C -NMR spectra of *(1R,2S,5R)*-1-(-)-(menthylacetyl)dimethyl-butylammonium bis(trifluoromethylsulfonyl)imide (CIL 3)

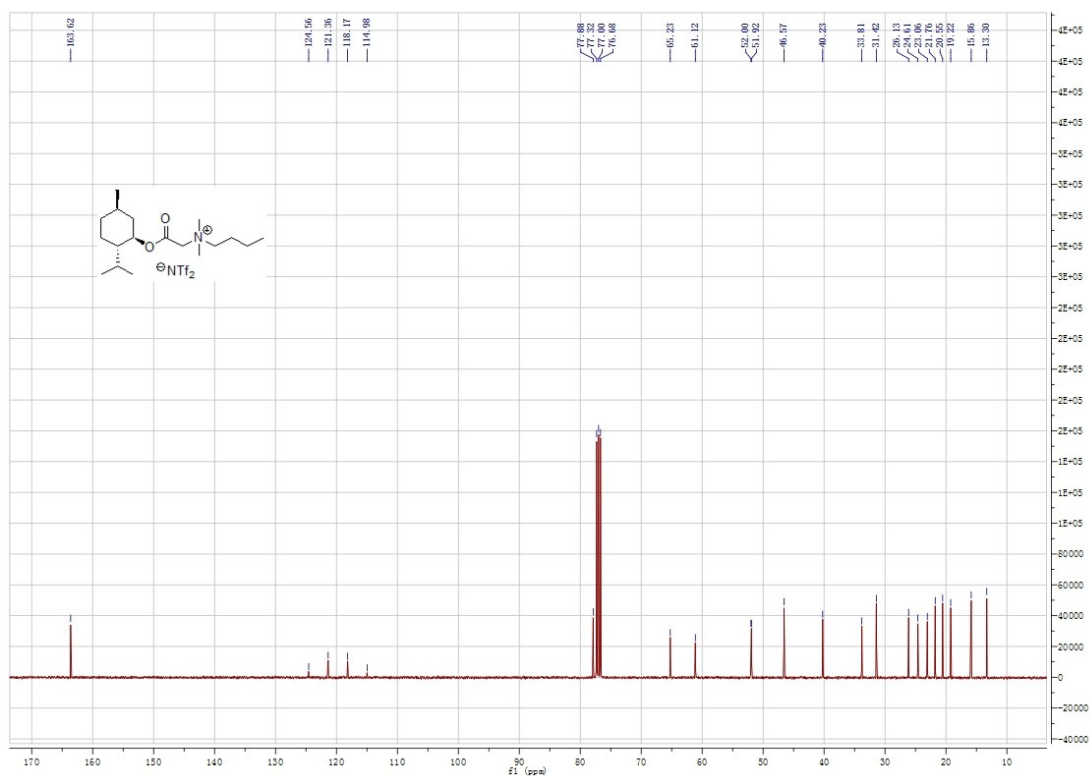


Figure S9: Representative HPLC chromatogram for the racemic Diels-Alder reaction in dichloromethane

