Supplementary Material (ESI) for Organic and Biomolecular Chemistry

Electronic Supporting Information

Efficient Resolution of Racemic *N*-Benzyl β^3-Amino Acids by Iterative Liquid-Liquid Extraction with a Chiral (Salen)Cobalt(III) Complex as Enantioselective Selector

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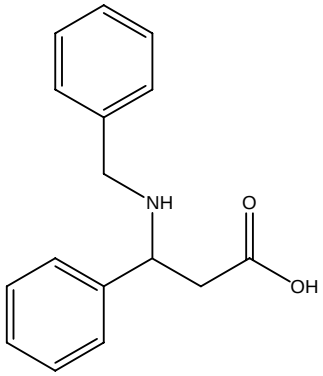
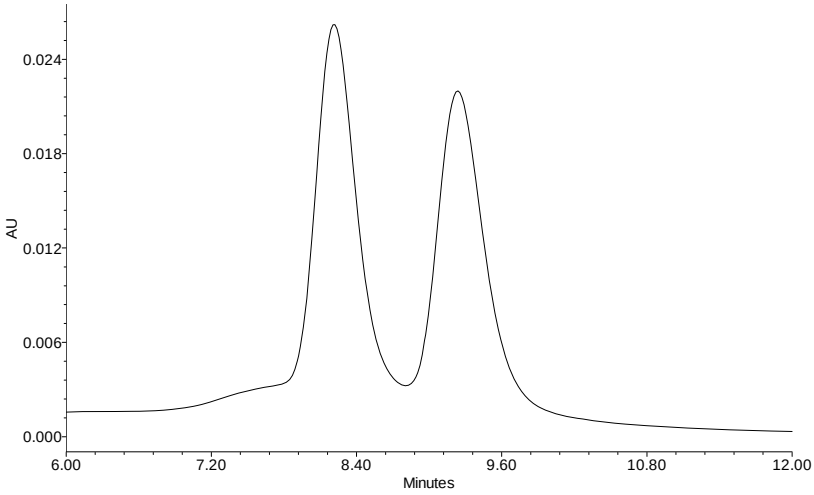
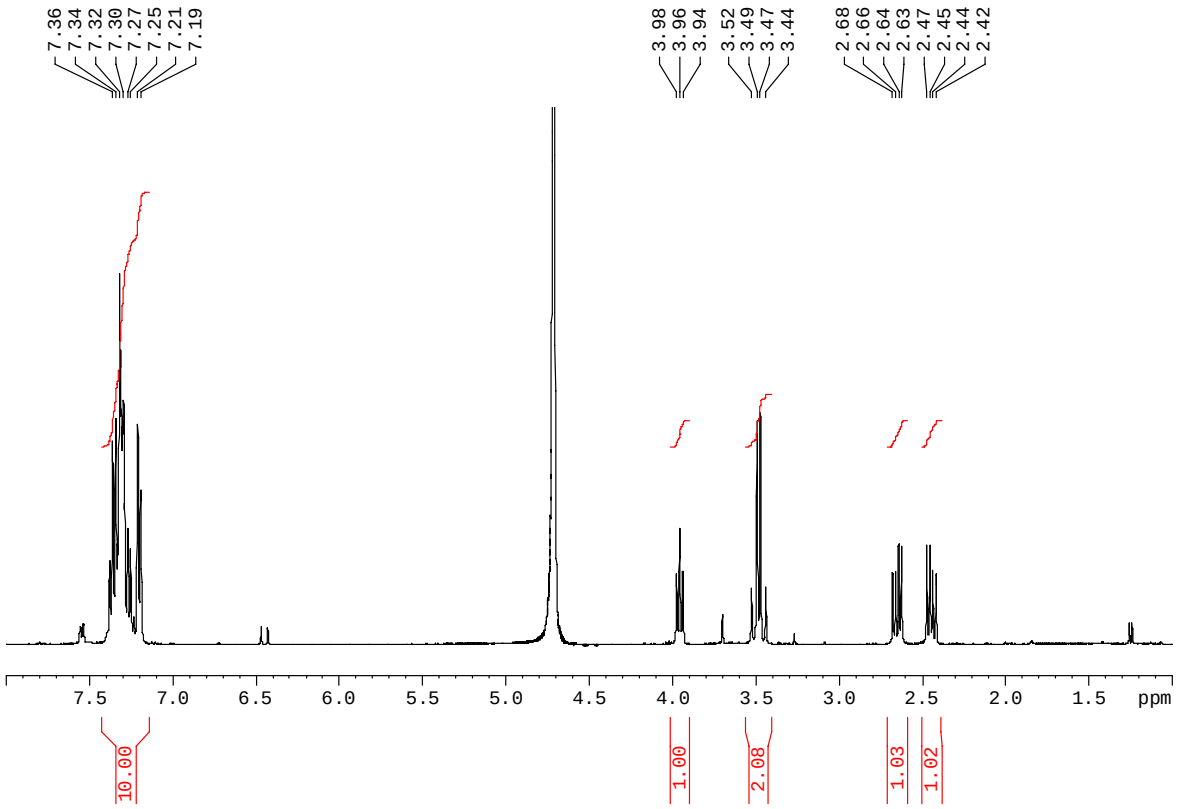
(*rac*)-3-Benzylamino-3-phenylpropionic acid (*N*-benzyl-β^3-Homophenylglycine - *N*-Bn-β^3-hPhg).



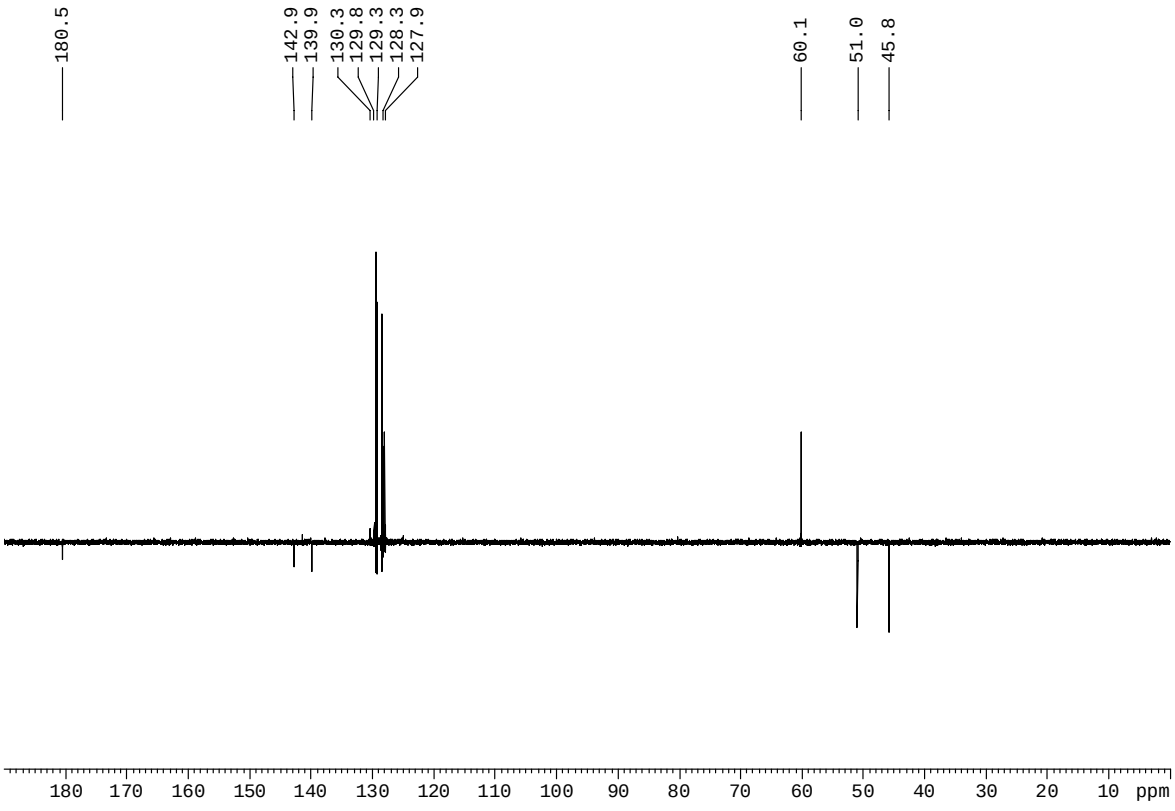
N-Bn-β^3-hPhg (HPLC trace of a racemic solution of *N*-Bn-β^3-hPhg)



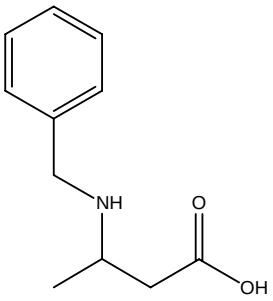
N-Bn-β^3-hPhg (^{1}H-NMR, D_2O-NaOH)



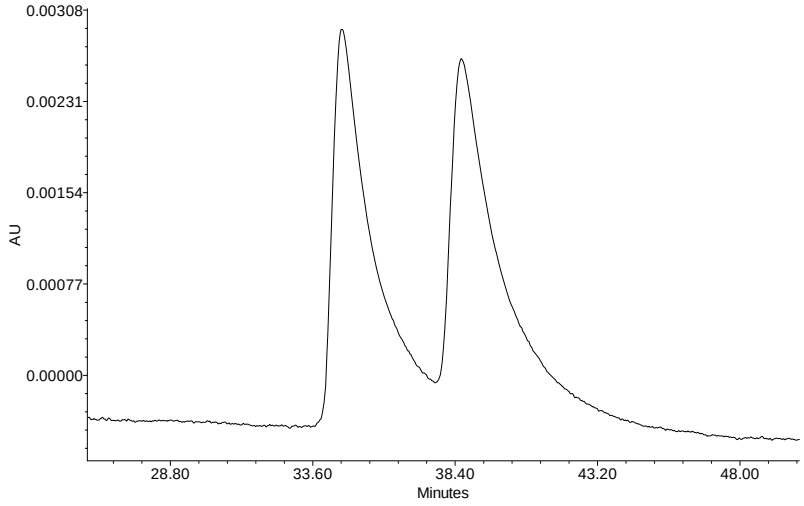
N-Bn-β^3-hPhg (^{13}C-NMR, D_2O-NaOH)



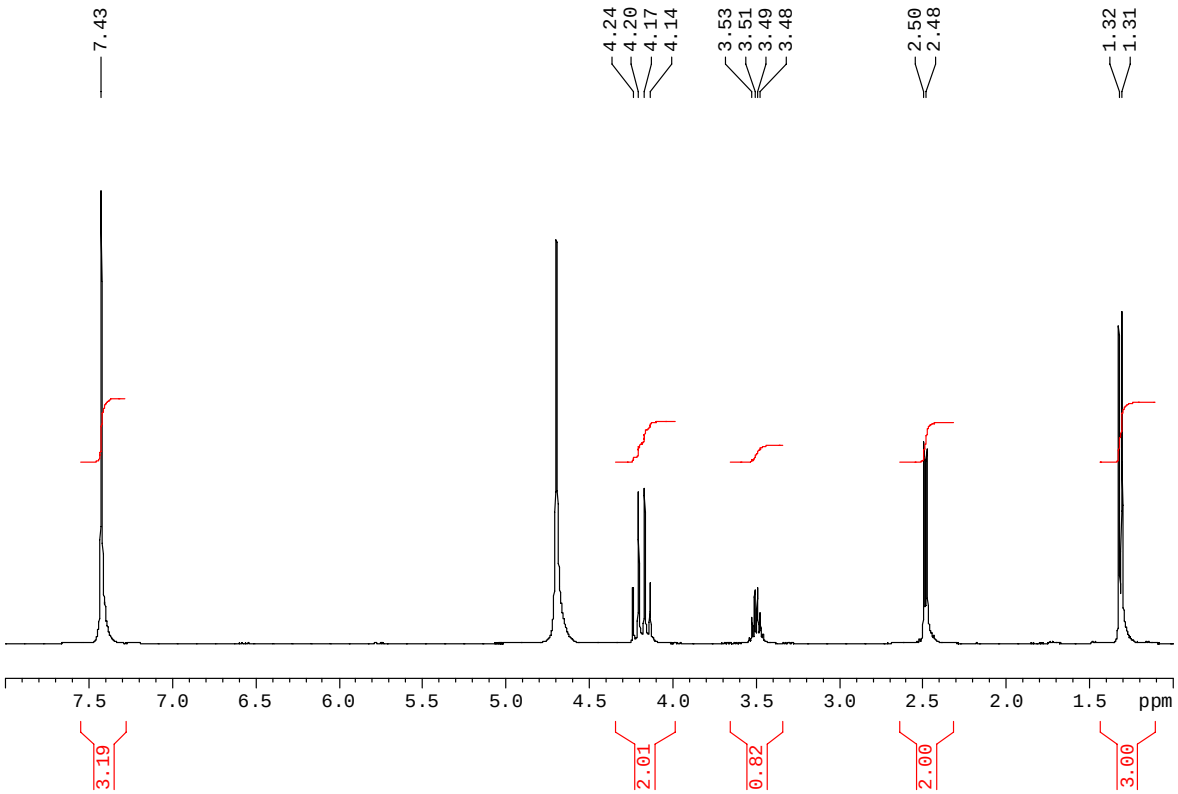
(*rac*)-3-Benzylaminobutyric acid (*N*-benzyl-β^3-homoalanine - *N*-Bn-β^3-hAla).



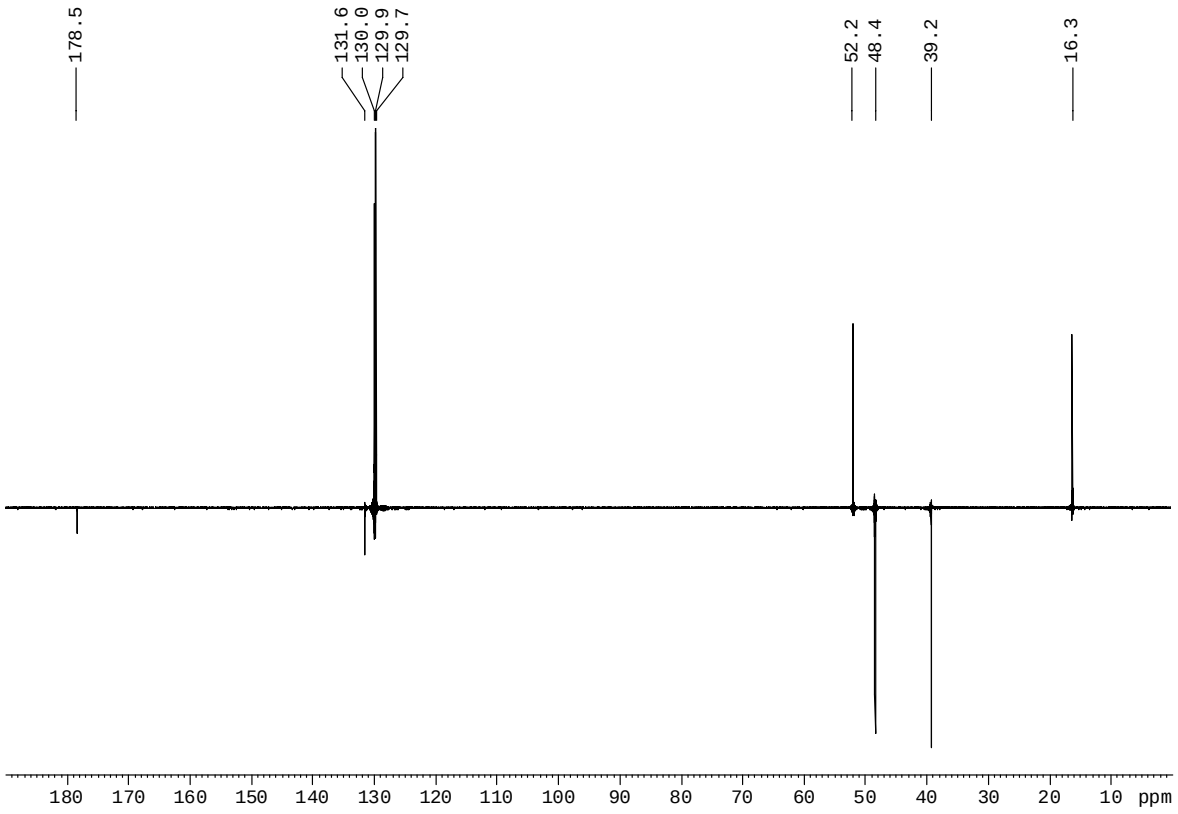
N-Bn-β^3-hAla (HPLC trace of a racemic solution of *N*-Bn-β^3-hAla)



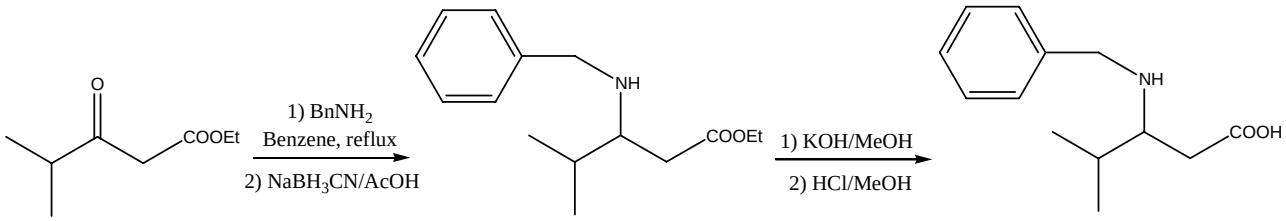
N-Bn-β^3-hAla (^{1}H-NMR, D_2O)



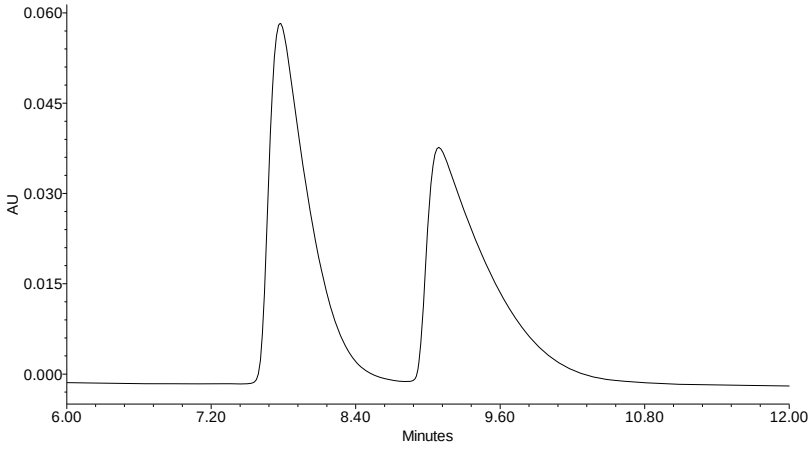
N-Bn-β^3-hAla (^{13}C-NMR, D_2O)



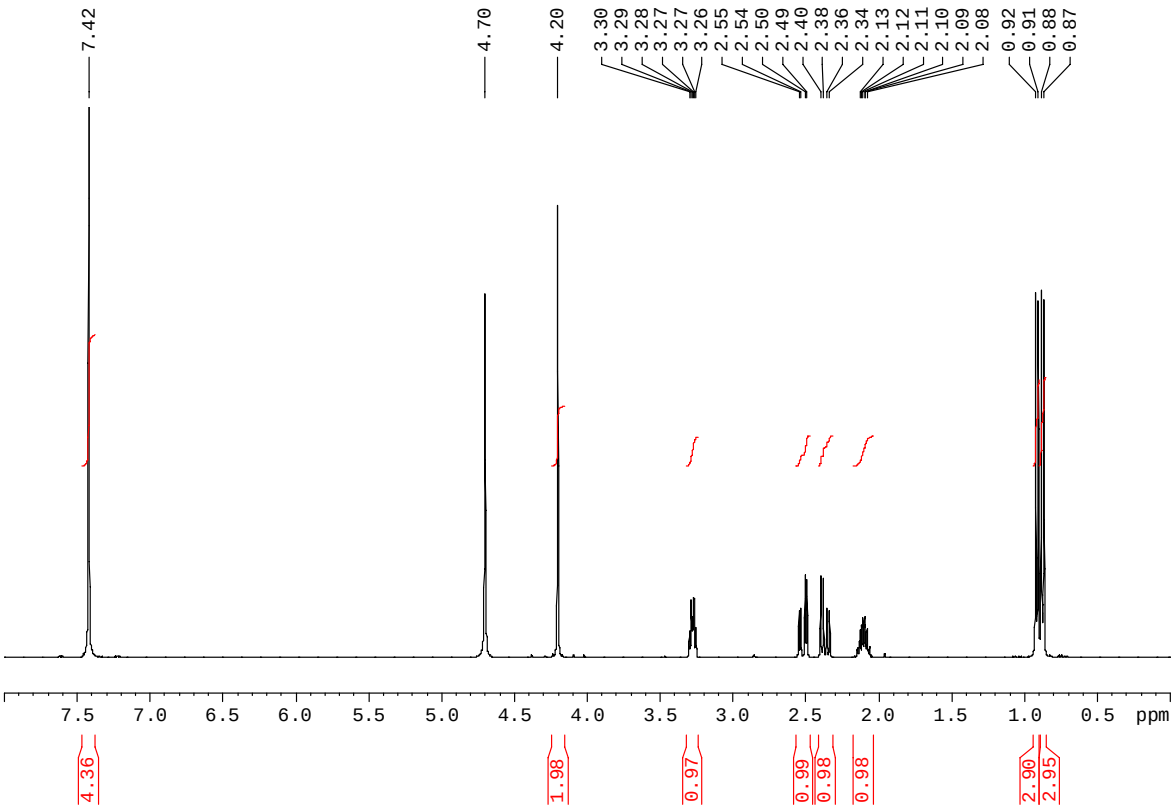
(*rac*)-3-Benzylamino-4-methyl pentanoic acid (*N*-benzyl-β^3-Homovaline - *N*-Bn-β^3-hVal).



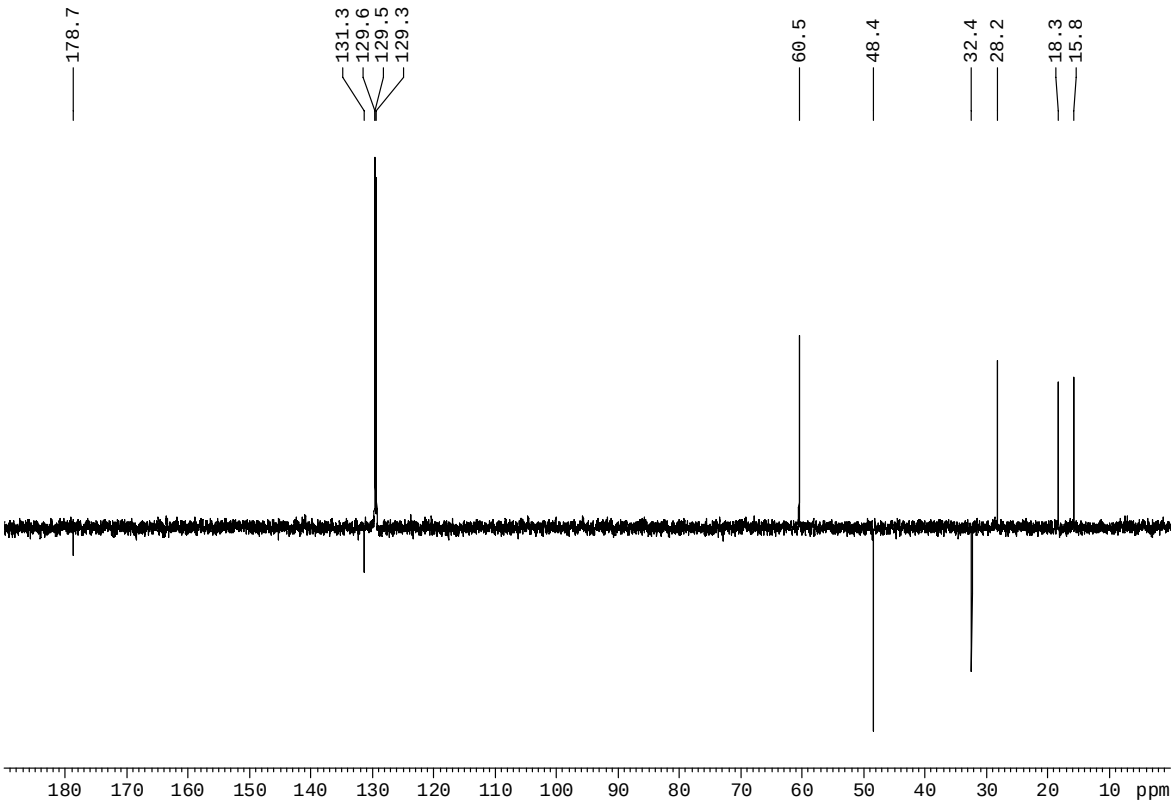
N-Bn-β^3-hVal (HPLC trace of a racemic solution of *N*-Bn-β^3-hVal)



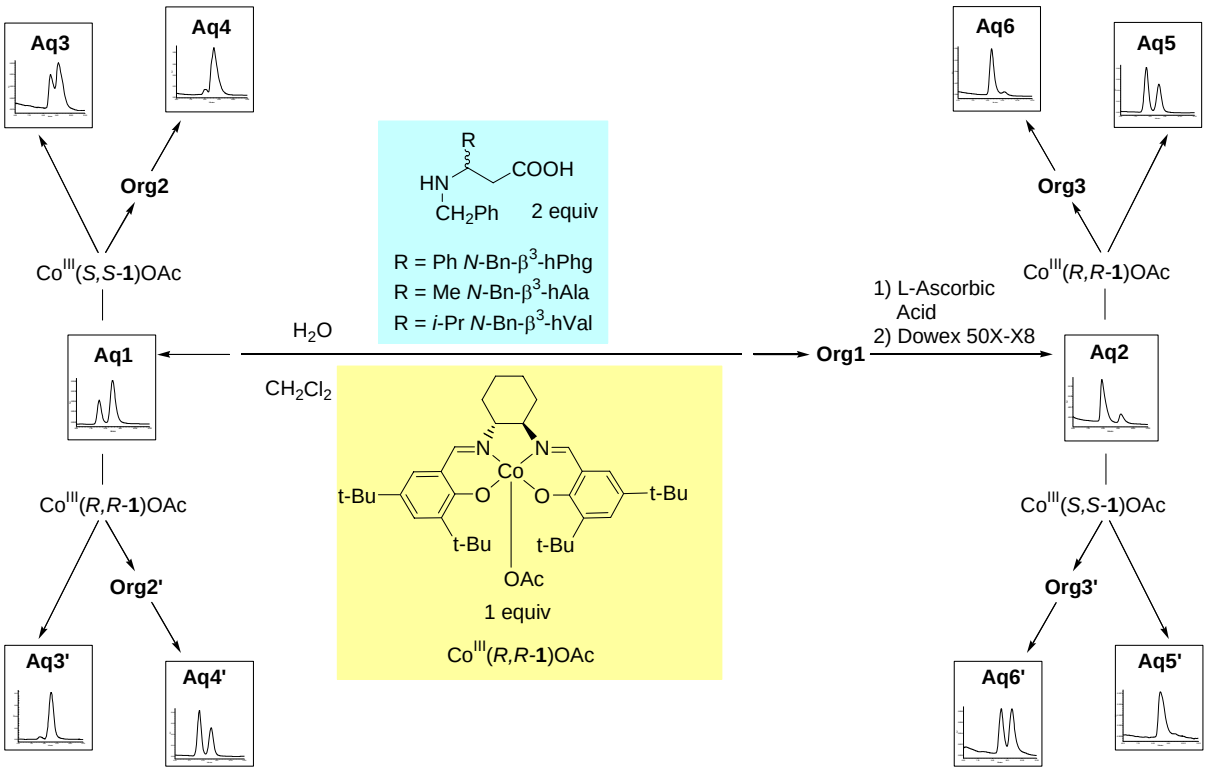
N-Bn-β^3-hVal (^{1}H-NMR, D_2O)



N-Bn-β^3-hVal (^{13}C-NMR, D_2O)

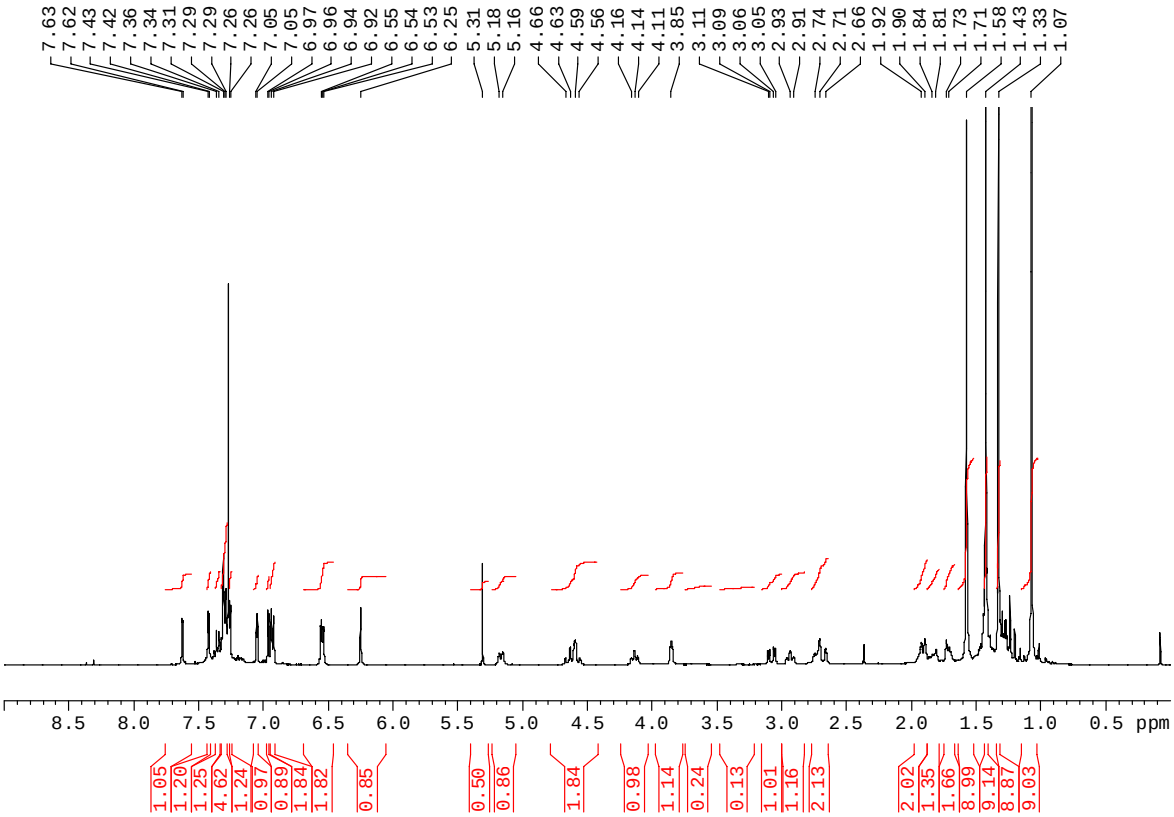


Extraction/separation Scheme

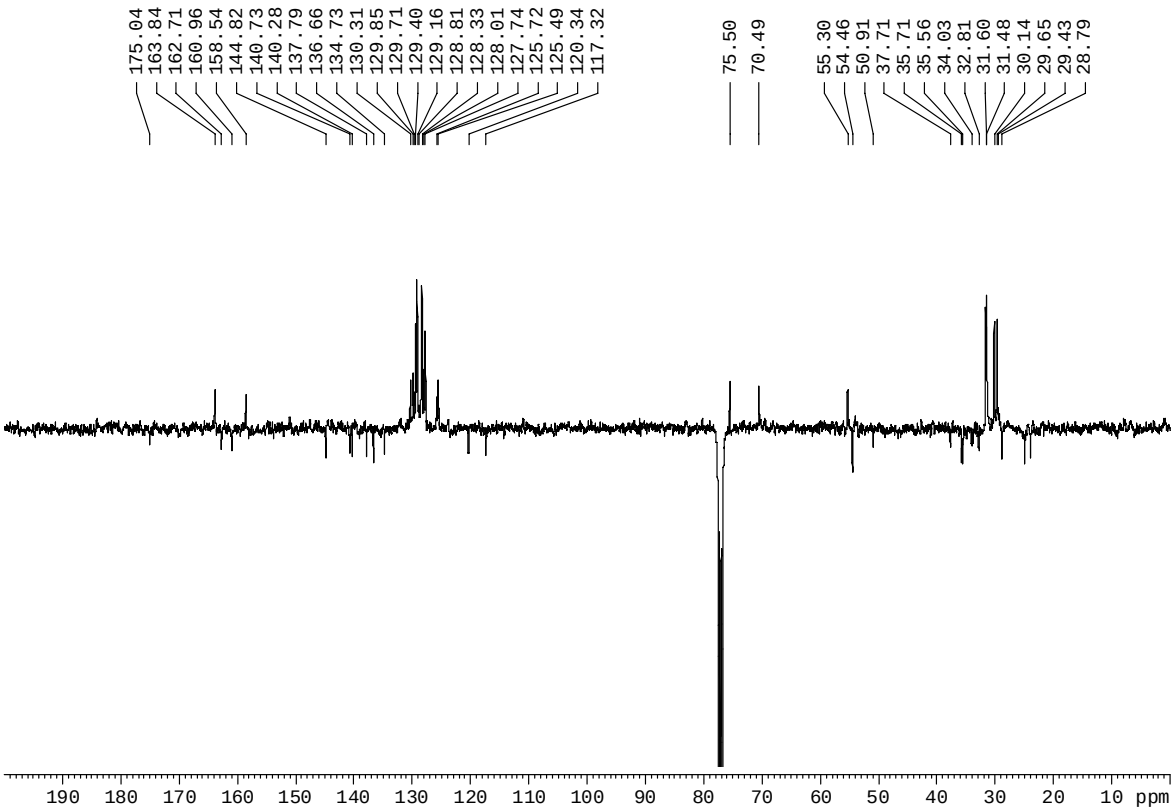


Extraction of *N*-Bn-β^3-hPhg.

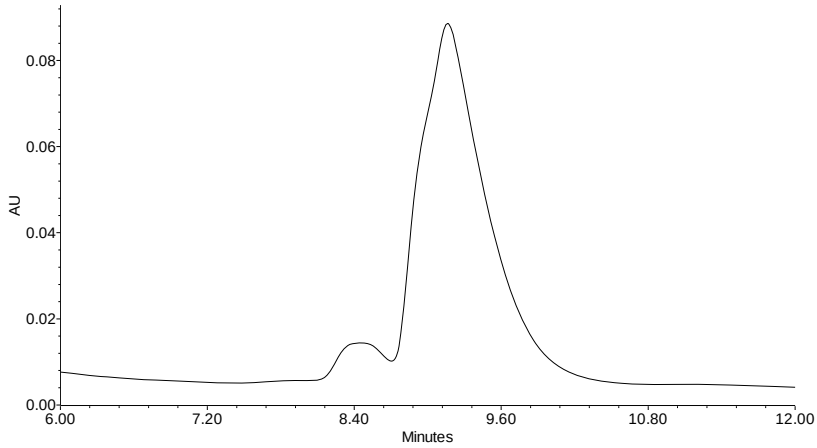
^{1}H-NMR spectrum in $CDCl_3$ of (*R*,*R*)-[Co^{III}(**1**)(*N*-Bn-β^3-hPhg)] obtained from Org1



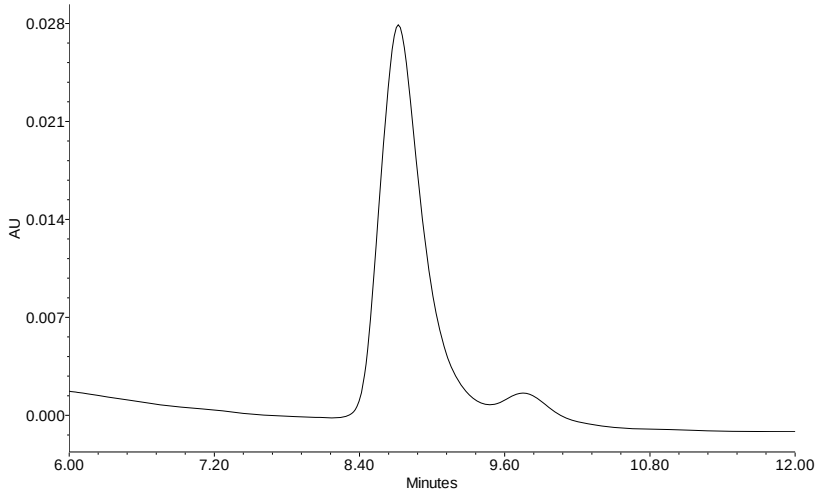
^{13}C-NMR spectrum in $CDCl_3$ of (*R*,*R*)-[Co^{III}(**1**)(*N*-Bn-β^3-hPhg)] obtained from Org1



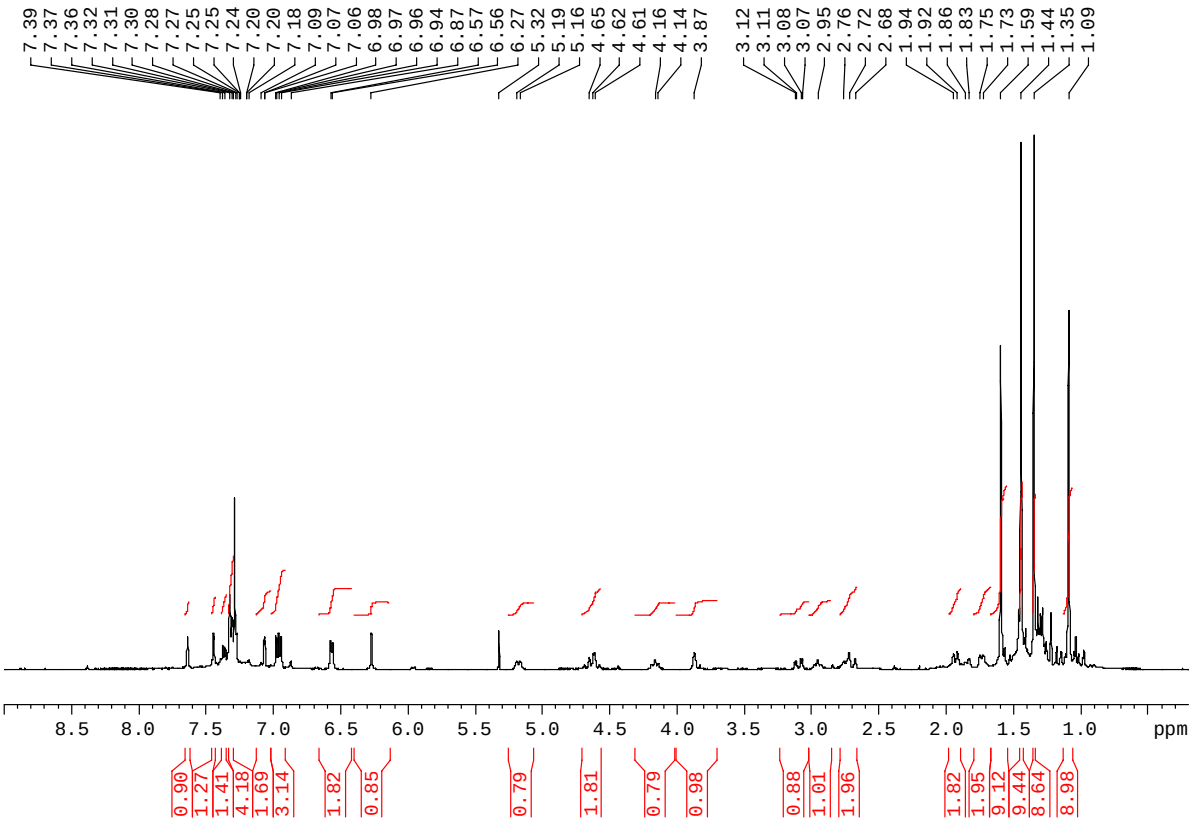
HPLC trace of the *N*-Bn-β^3-hPhg solution (Aq4) obtained after the second extraction of *N*-Bn-β^3-hPhg with (*S*,*S*)-[Co^{III}(**1**)(OAc)] and cleavage with ascorbic acid (t_r = 8.5 min, *S* enantiomer; t_r = 9.4 min, *R* enantiomer; 90% ee).



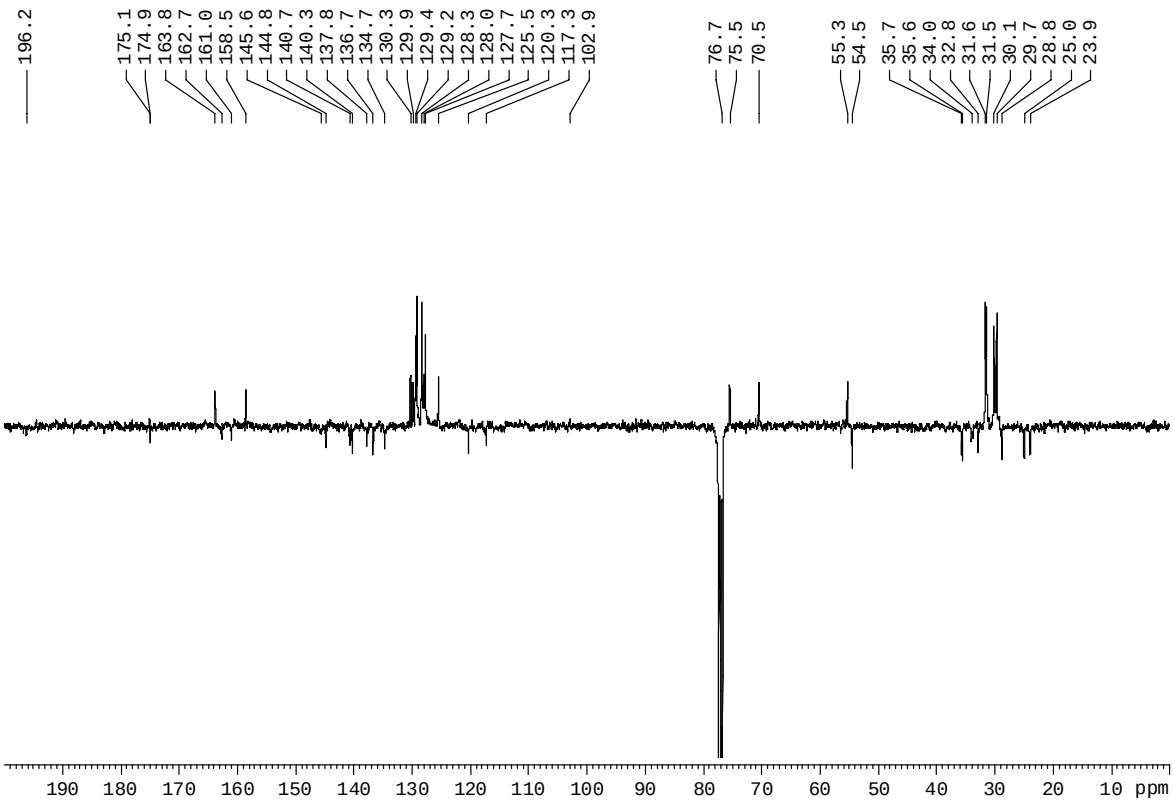
HPLC trace of the solution of *N*-Bn-β^3-hPhg (Aq6) obtained from the organic phase (Org3) following the second extraction of *N*-Bn-β^3-hPhg with (*R*,*R*)-[Co^{III}(**1**)(OAc)] and cleavage with ascorbic acid (t_r = 8.6 min, *R* enantiomer; t_r = 9.4 min, *S* enantiomer; 90% ee).



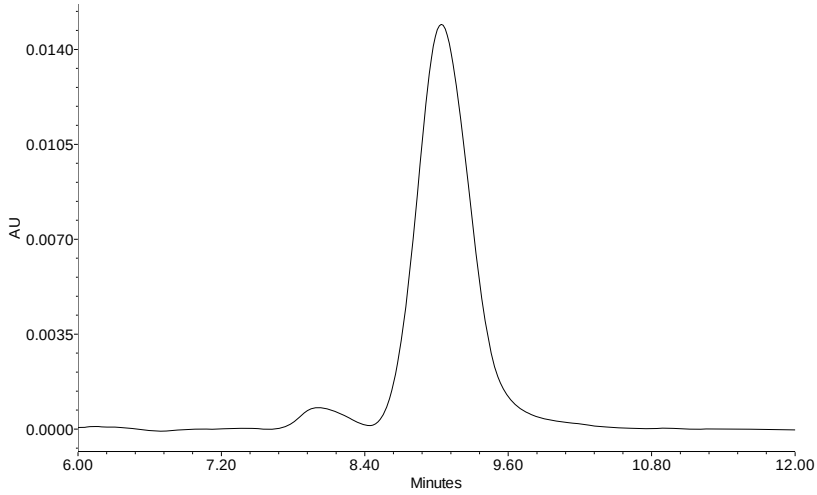
^{1}H-NMR spectra in $CDCl_3$ of (*R*,*R*)-[Co^{III}(**1**)(*N*-Bn-β^3-hPhg)] obtained from Org2'.



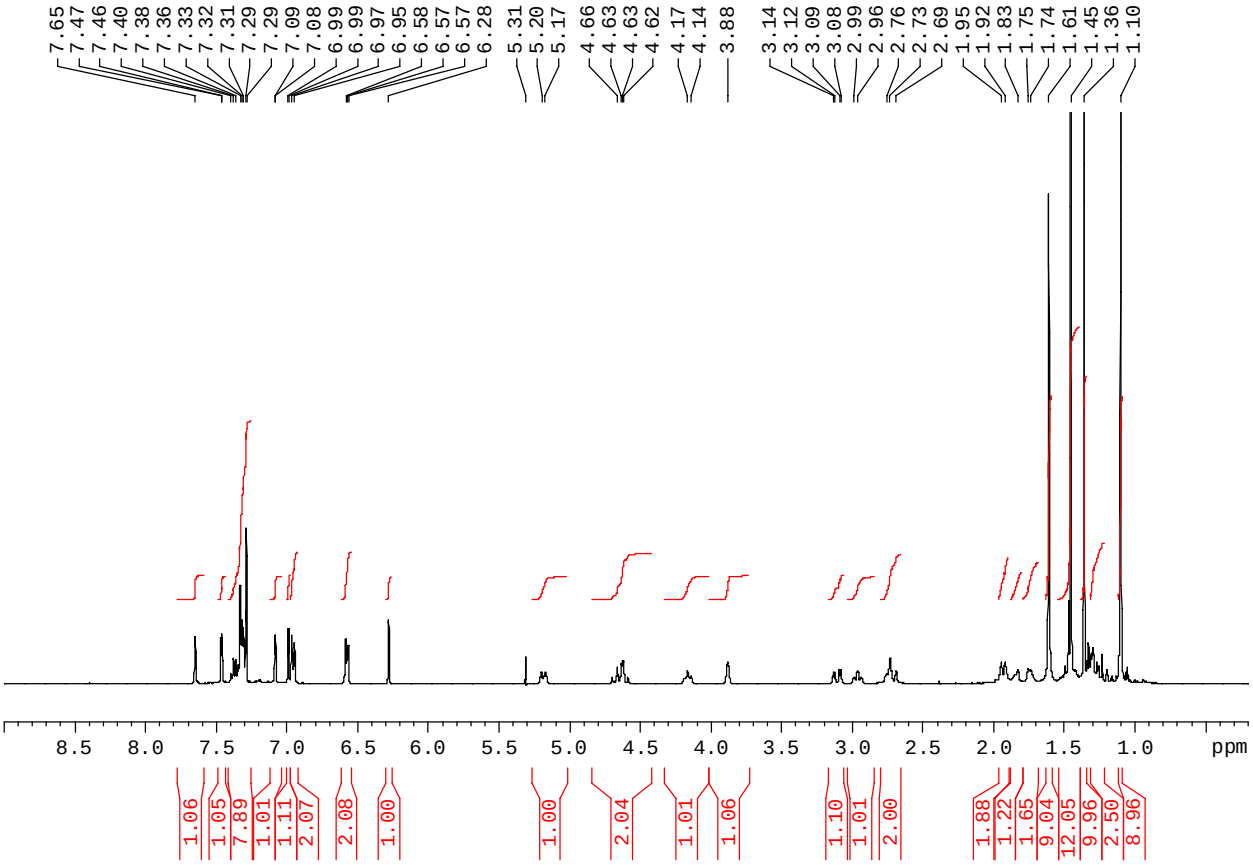
^{13}C-NMR spectra in $CDCl_3$ of (*R*,*R*)-[Co^{III}(**1**)(*N*-Bn-β^3-hPhg)] obtained from Org2'.



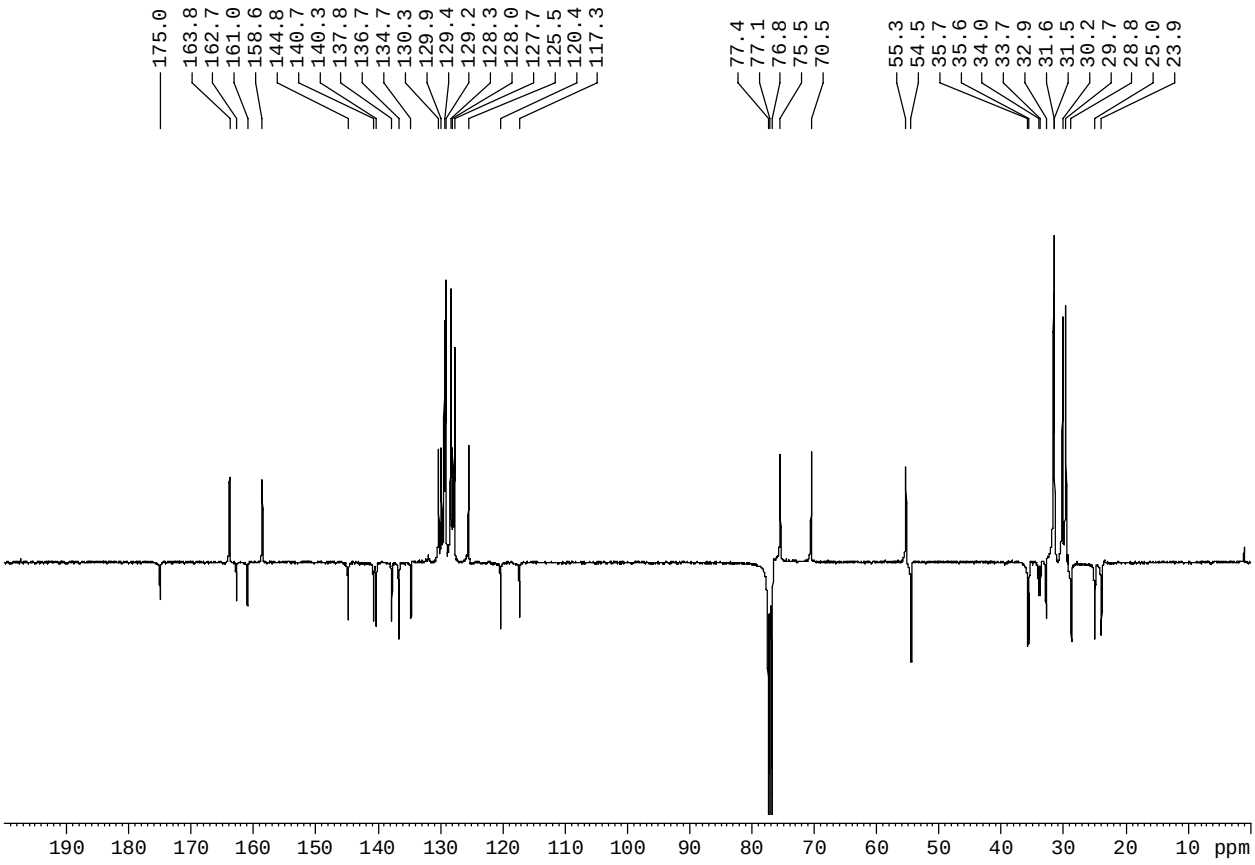
HPLC trace of the aqueous phase (Aq3') following the second extraction of *N*-Bn-β^3-hPhg with (*R*,*R*)-[Co^{III}(**1**)(OAc)] (t_r = 8.1 min, *S* enantiomer; t_r = 9.1 min, *R* enantiomer; 93% ee).



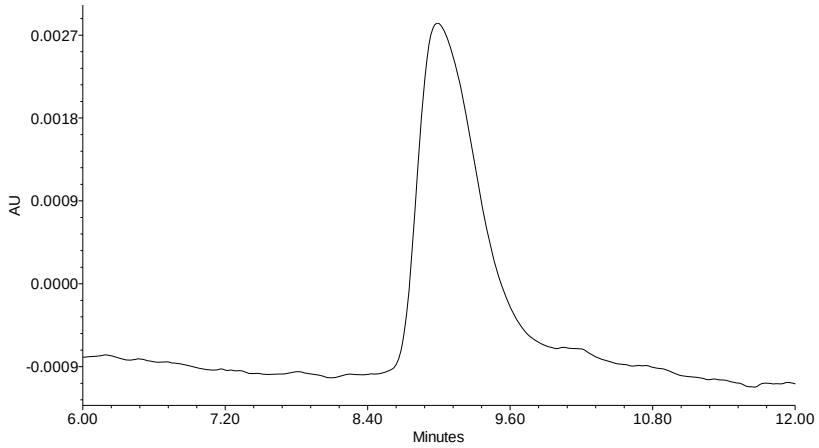
^{1}H-NMR spectra in $CDCl_3$ of (*S*,*S*)-[Co^{III}(**1**)(*N*-Bn-β^3-hPhg)] obtained from Org3'.



^{13}C-NMR spectra in $CDCl_3$ of (*S*,*S*)-[Co^{III}(**1**)(*N*-Bn-β^3-hPhg)] obtained from Org3'.

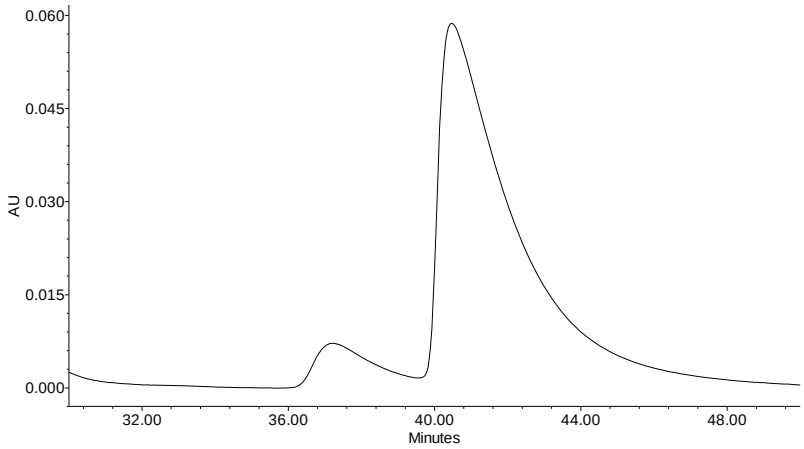


HPLC trace of the aqueous phase (Aq5') following the second extraction of *N*-Bn-β^3-hPhg with (*S*,*S*)-[Co^{III}(**1**)(OAc)] (t_r = 8.5 min, *S* enantiomer; t_r = 9.7 min, *R* enantiomer; 93% ee).

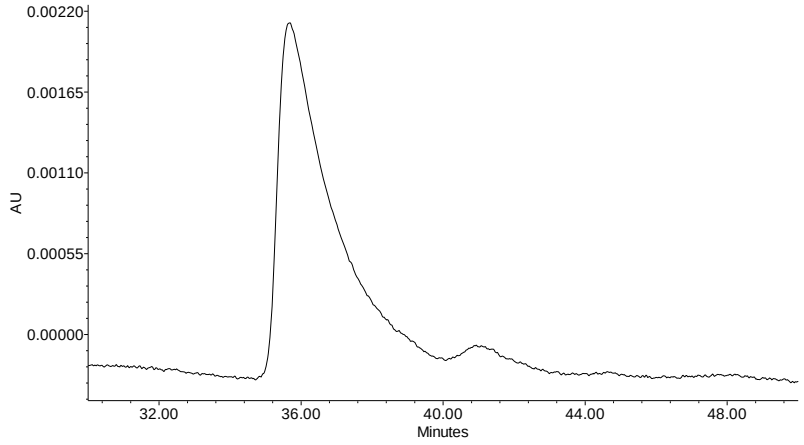


Extraction of *N*-Bn-β^3-hAla.

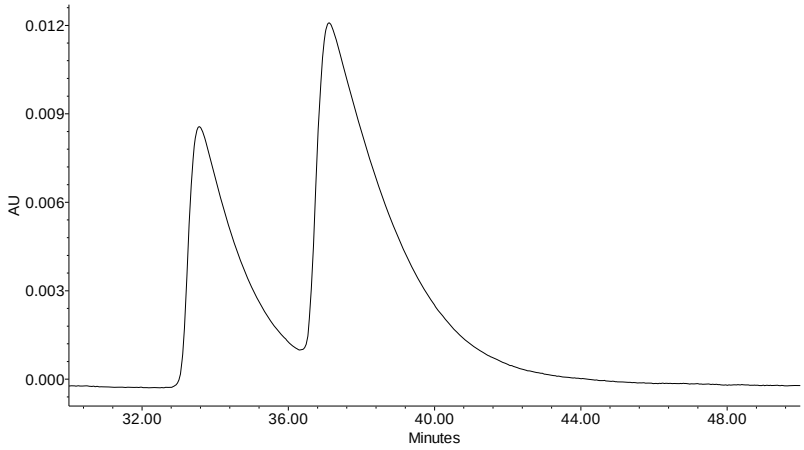
HPLC trace of the *N*-Bn-β^3-hAla solution (Aq4) following the second extraction of *N*-Bn-β^3-hAla with (*S*,*S*)-[Co^{III}(**1**)(OAc)] (t_r = 37.0 min, *R* enantiomer; t_r = 40.5 min, *S* enantiomer; 88% ee).



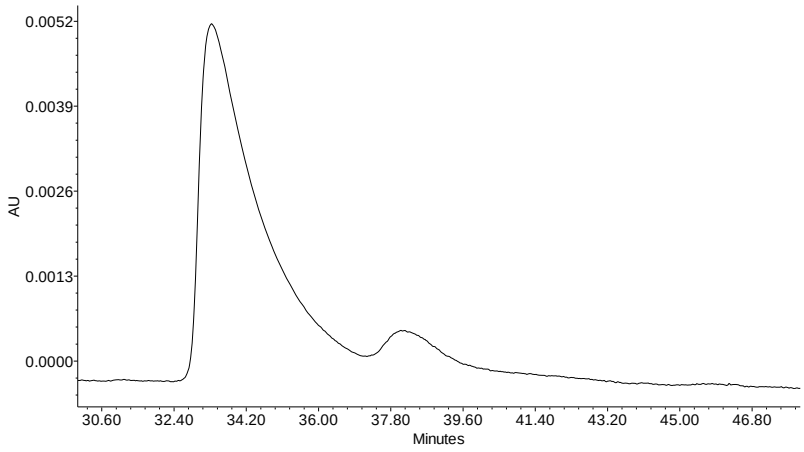
HPLC trace of the solution of *N*-Bn-β^3-hAla (Aq6) following the second extraction of *N*-Bn-β^3-hAla with (*R*,*R*)-[Co^{III}(**1**)(OAc)] (t_r = 35.1 min, *R* enantiomer; t_r = 40.8 min, *S* enantiomer; 90% ee).



HPLC trace of the aqueous phase (Aq3') following the second extraction of *N*-Bn-β^3-hAla with (*R*,*R*)-[Co^{III}(**1**)(OAc)] (t_r = 33.5 min, *R* enantiomer; t_r = 37.1 min, *S* enantiomer; 36% ee).

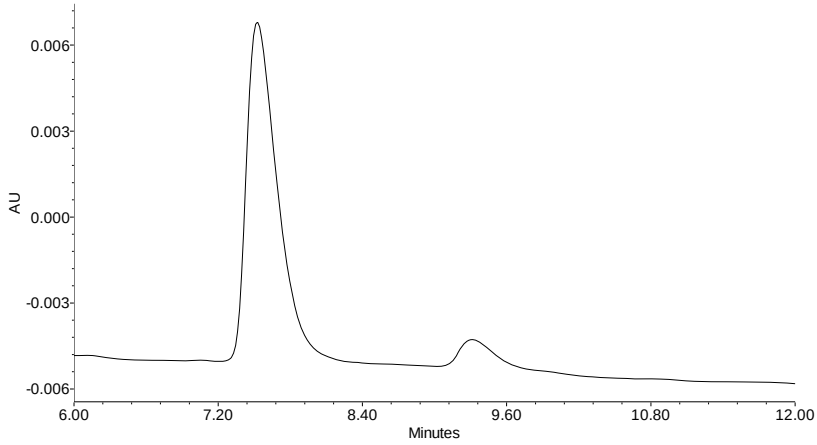


HPLC trace of the aqueous phase (Aq5') following the second extraction of *N*-Bn-β^3-hAla with (*S*,*S*)-[Co^{III}(**1**)(OAc)] (t_r = 33.2 min, *R* enantiomer; t_r = 38.1 min, *S* enantiomer; 83% ee).

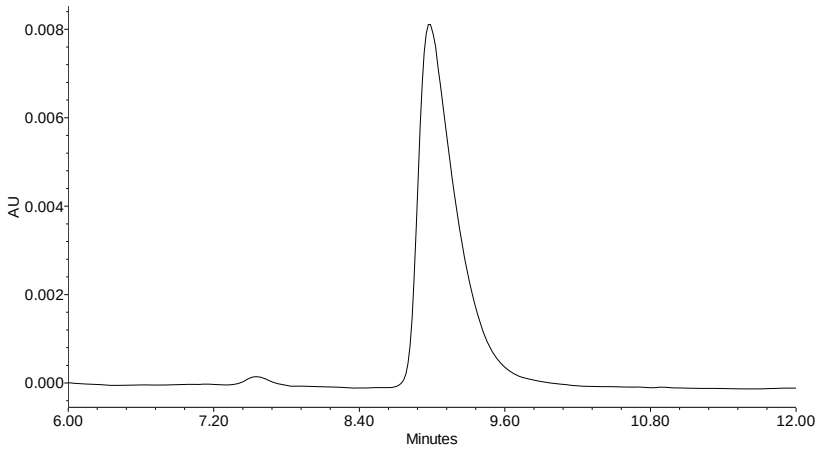


Extraction of *N*-Bn-β^3-hVal.

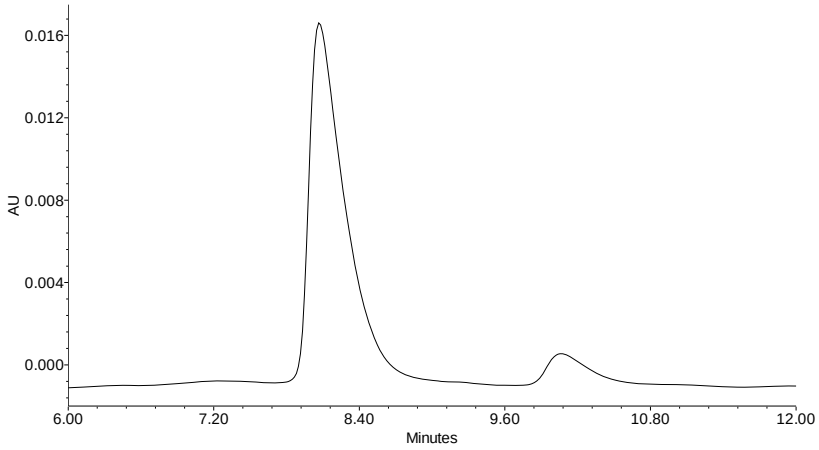
HPLC trace of the *N*-Bn-β^3-hVal solution (Aq4) following the second extraction of *N*-Bn-β^3-hVal with (*S*,*S*)-[Co^{III}(**1**)(OAc)] [t_r = 7.5 min, (+) enantiomer; t_r = 9.3 min, (-) enantiomer; 90% ee]



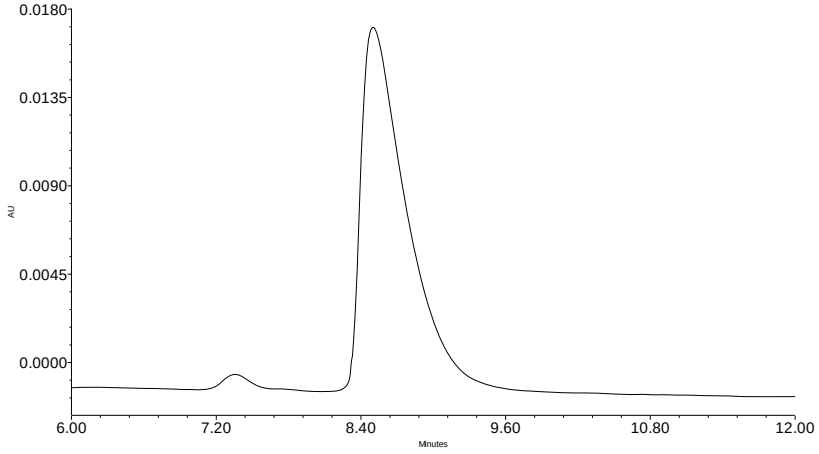
HPLC trace of the solution of *N*-Bn-β^3-hVal (Aq6) following the second extraction of *N*-Bn-β^3-hVal with (*R*,*R*)-[Co^{III}(**1**)(OAc)] [t_r = 7.7 min, (+) enantiomer; t_r = 9.0 min, (-) enantiomer; 93% ee].



HPLC trace of the *N*-Bn-β^3-hVal solution (Aq3') following the second extraction of *N*-Bn-β^3-hVal with (*R*,*R*)-[Co^{III}(**1**)(OAc)] [t_r = 7.8 min, (+) enantiomer; t_r = 9.8 min, (-) enantiomer; 80% ee]



HPLC trace of the solution of *N*-Bn-β^3-hVal (Aq5') following the second extraction of *N*-Bn-β^3-hVal with (*S*,*S*)-[Co^{III}(**1**)(OAc)] [t_r = 7.3 min, (+) enantiomer; t_r = 8.4 min, (-) enantiomer; 92% ee].



Attribution of the absolute configuration to ***N*-Bn-β^3-hVal**: by analogy with the complexation selectivity shown for ***N*-Bn-β^3-hPhg** and ***N*-Bn-β^3-hAla**, we attribute to (+)-***N*-Bn-β^3-hVal** the (*R*) absolute configuration: $[\alpha]_D^{24}$ = +35.6, *c* 0.80 in MeOH, 100% ee in favour of (*R*)-enantiomer.