

Supporting Information

Synthesis of the biological repeating unit of *Streptococcus pneumoniae* serotype 23F capsular polysaccharide

Kang Yu,^a Yin Qiao,^a Guofeng Gu,^{a,*} Jian Gao,^a Shuihong Cai,^b Zhongzhu Long,^b and Zhongwu Guo^{c,*}

a) National Glycoengineering Research Center and Shandong Provincial Key Laboratory of Carbohydrate Chemistry and Glycobiology, Shandong University, Jinan 250100, China

b) Qidong Dongyue Pharmaceutical Co., Ltd., Qidong, Jiangsu Province 226221, China

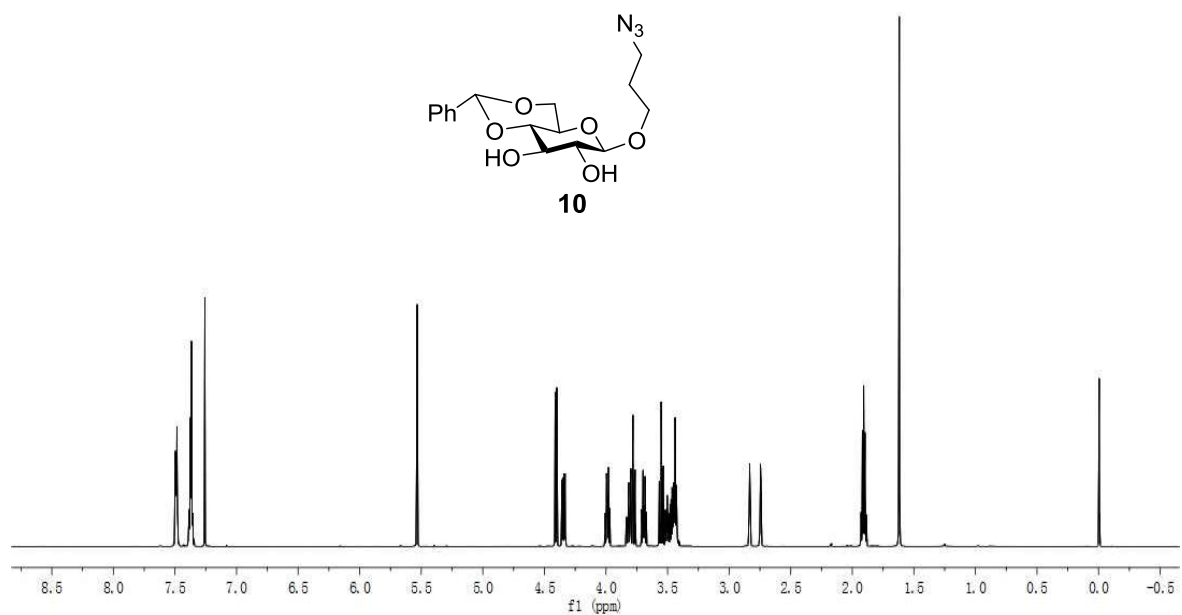
c) Department of Chemistry, University of Florida, 214 Leigh Hall, Gainesville, Florida 32611, United States

* Corresponding authors: guofenggu@sdu.edu.cn, zguo@chem.ufl.edu

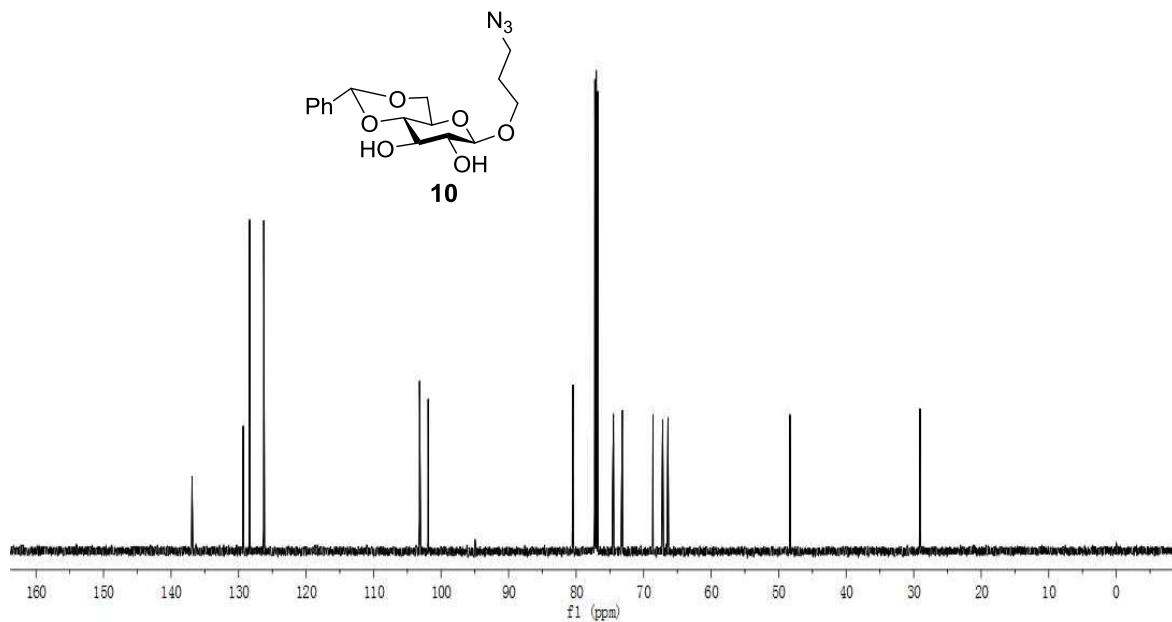
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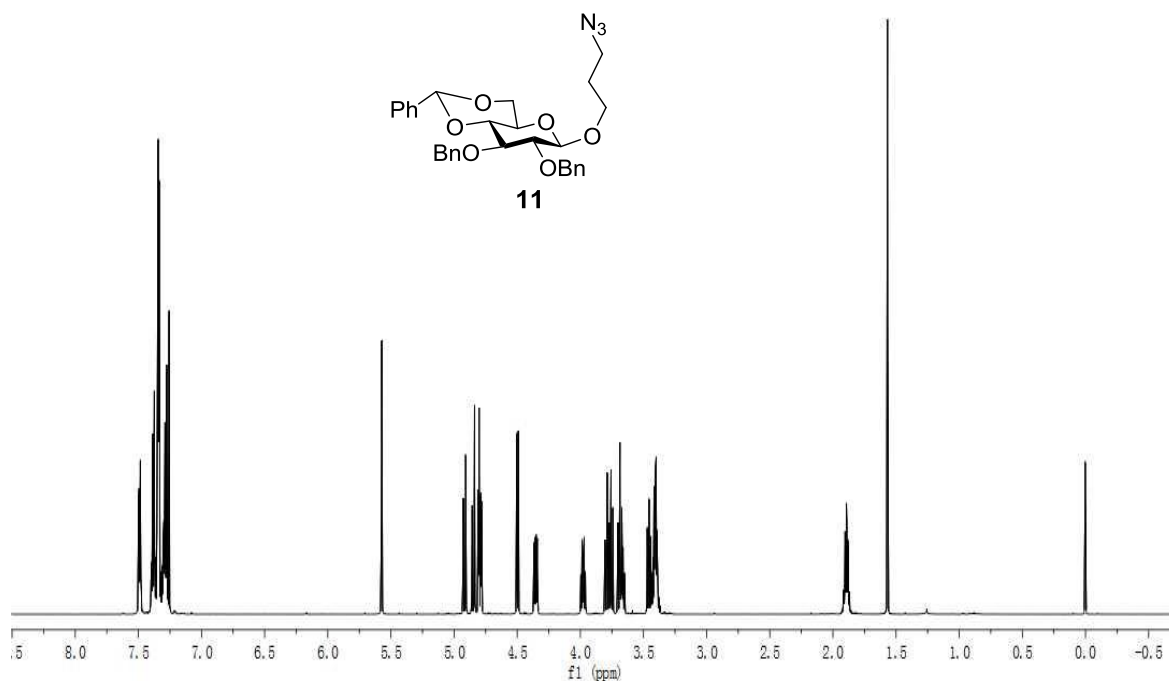
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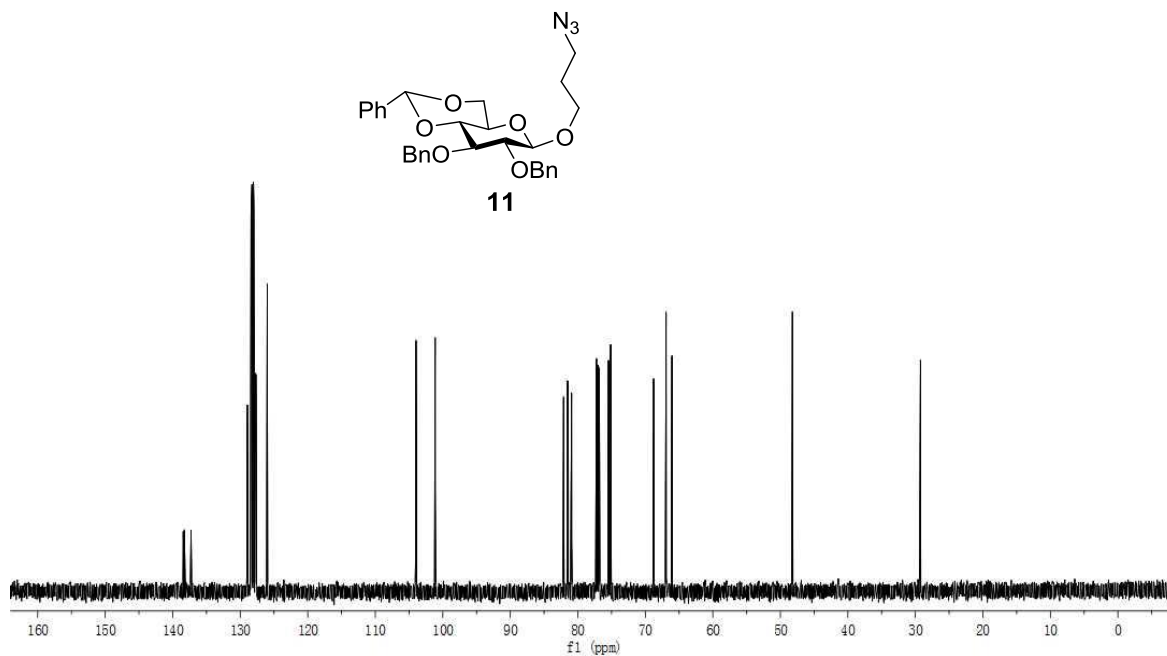
^1H NMR spectrum of compound **10** (600 MHz, CDCl_3 , 25 °C)



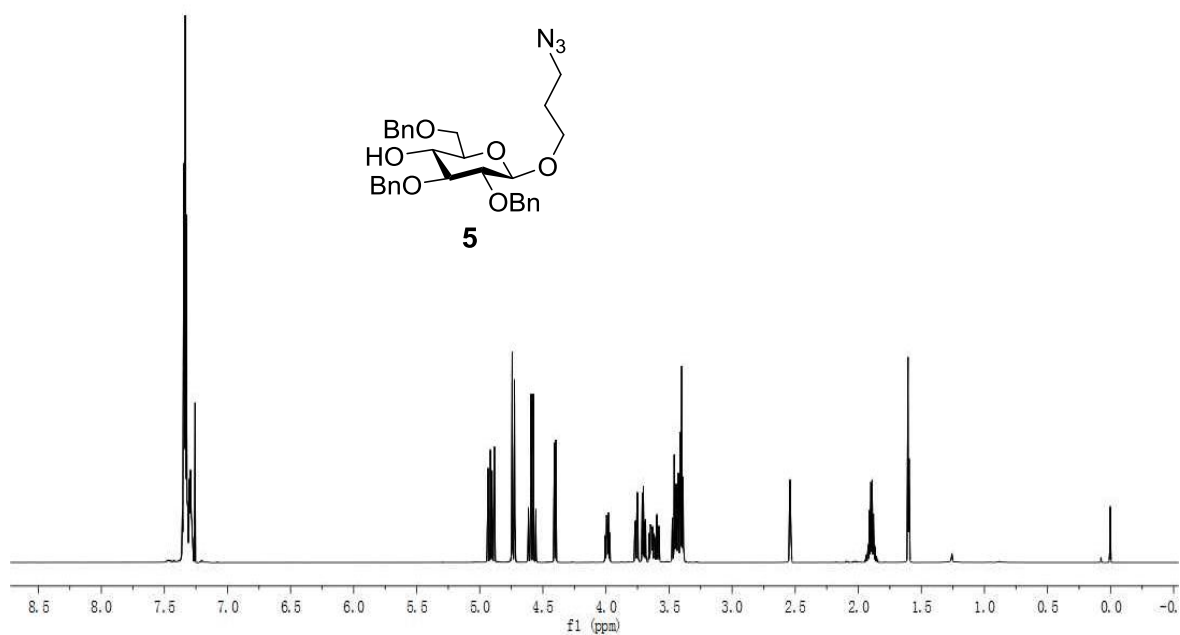
^{13}C NMR spectrum of compound **10** (150 MHz, CDCl_3 , 25 °C)



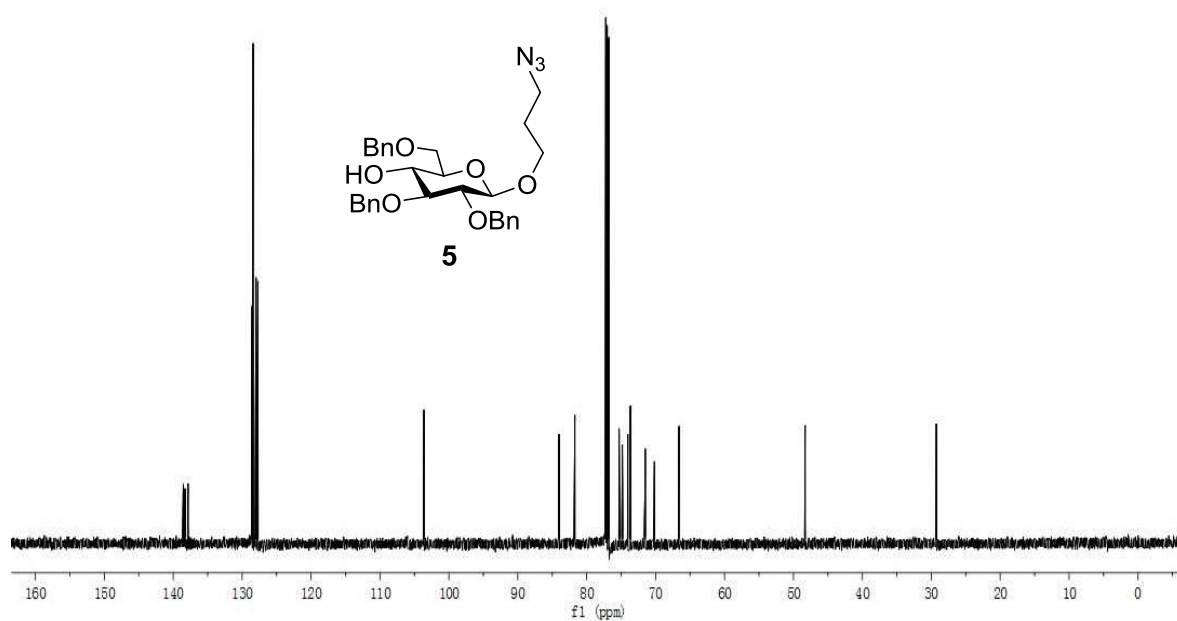
¹H NMR spectrum of compound **11** (600 MHz, CDCl₃, 25 °C)



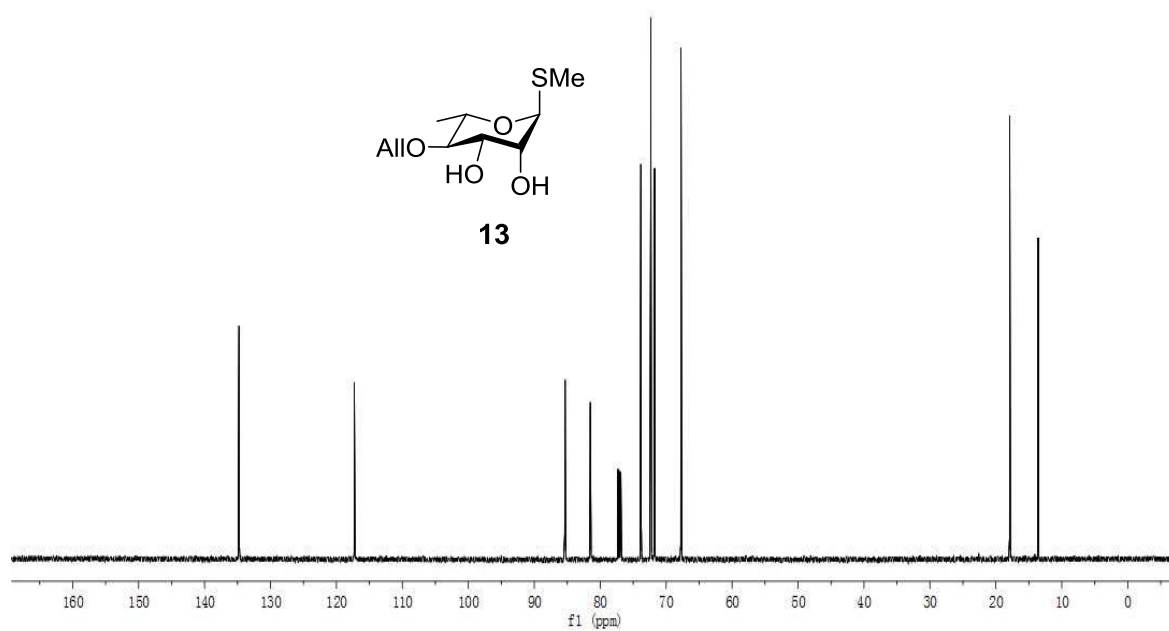
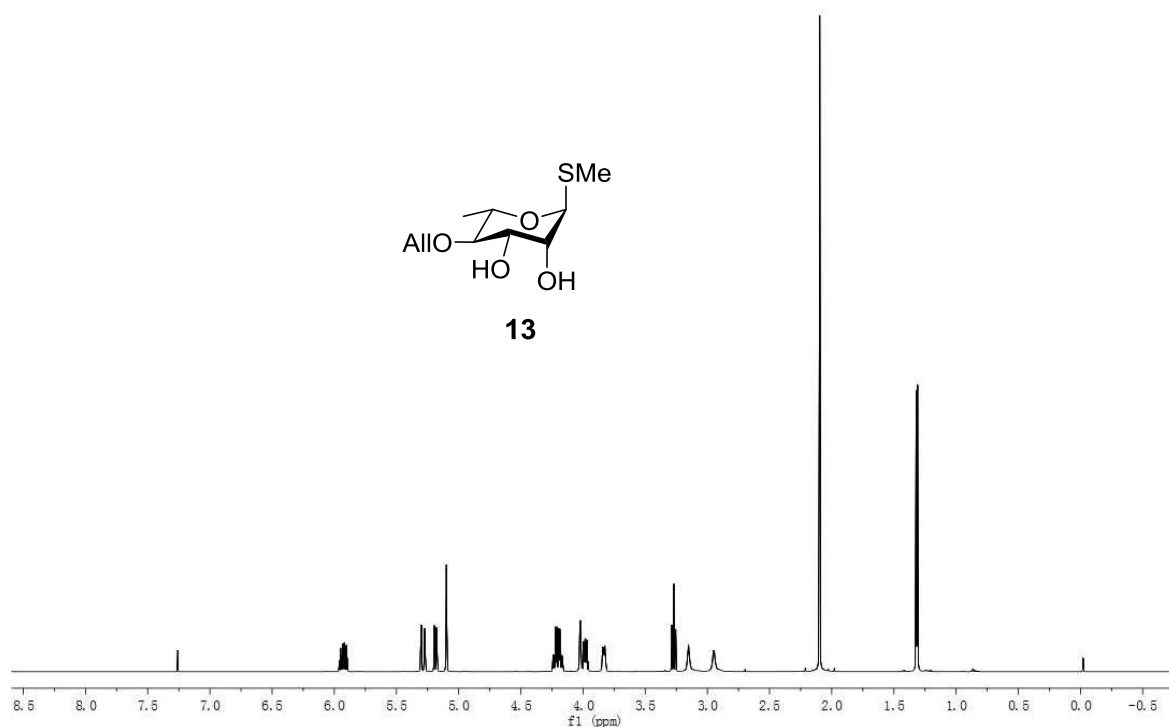
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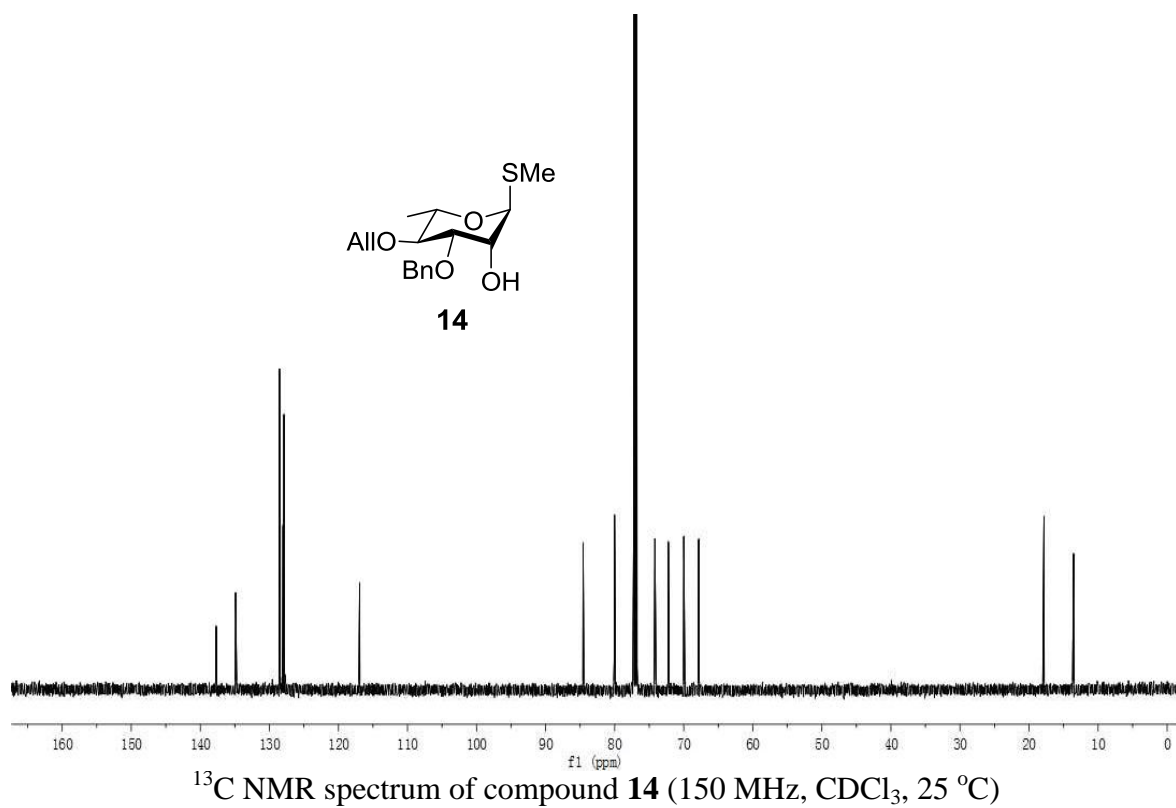
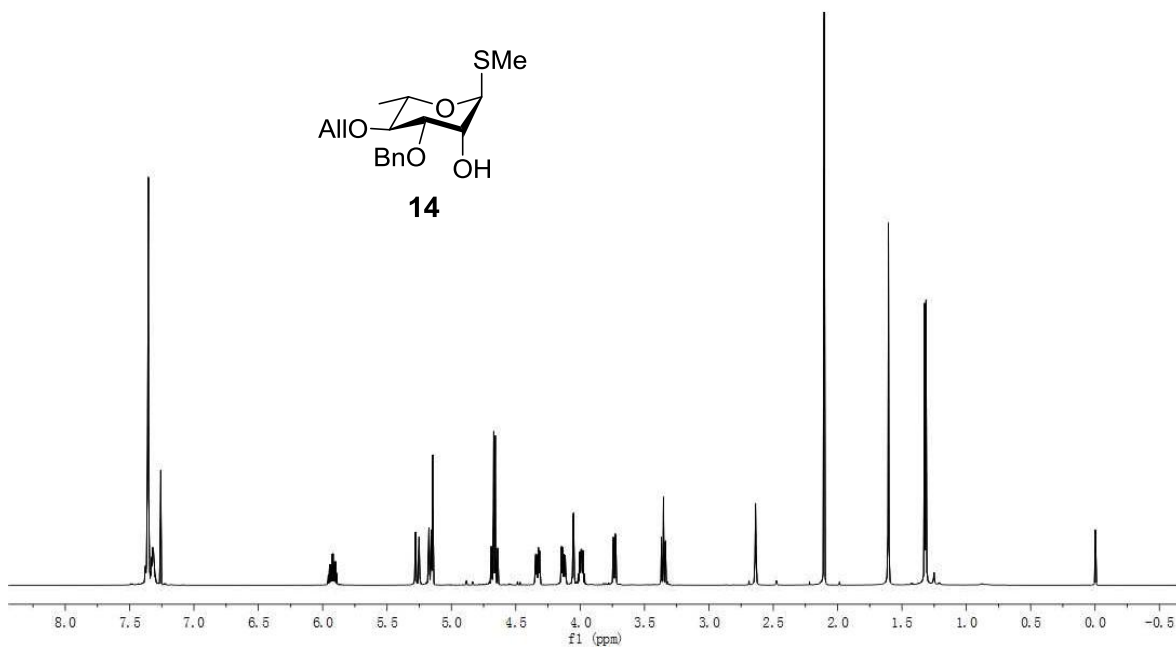


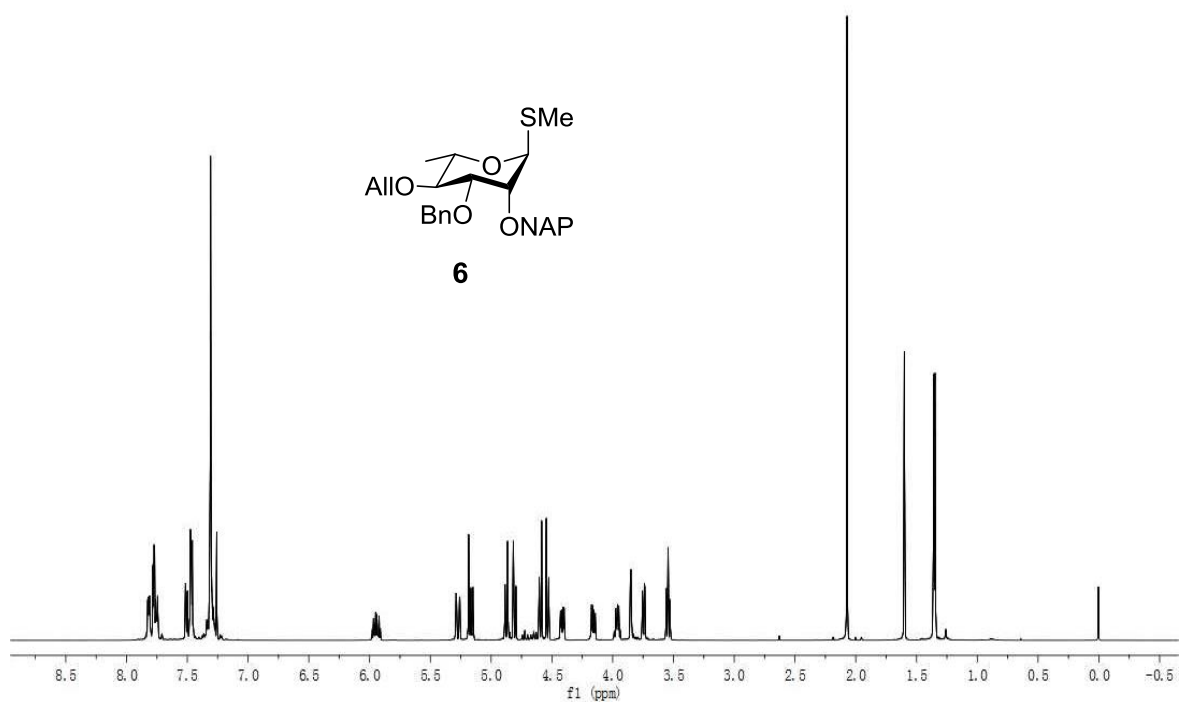
^1H NMR spectrum of compound **5** (600 MHz, CDCl_3 , 25 °C)



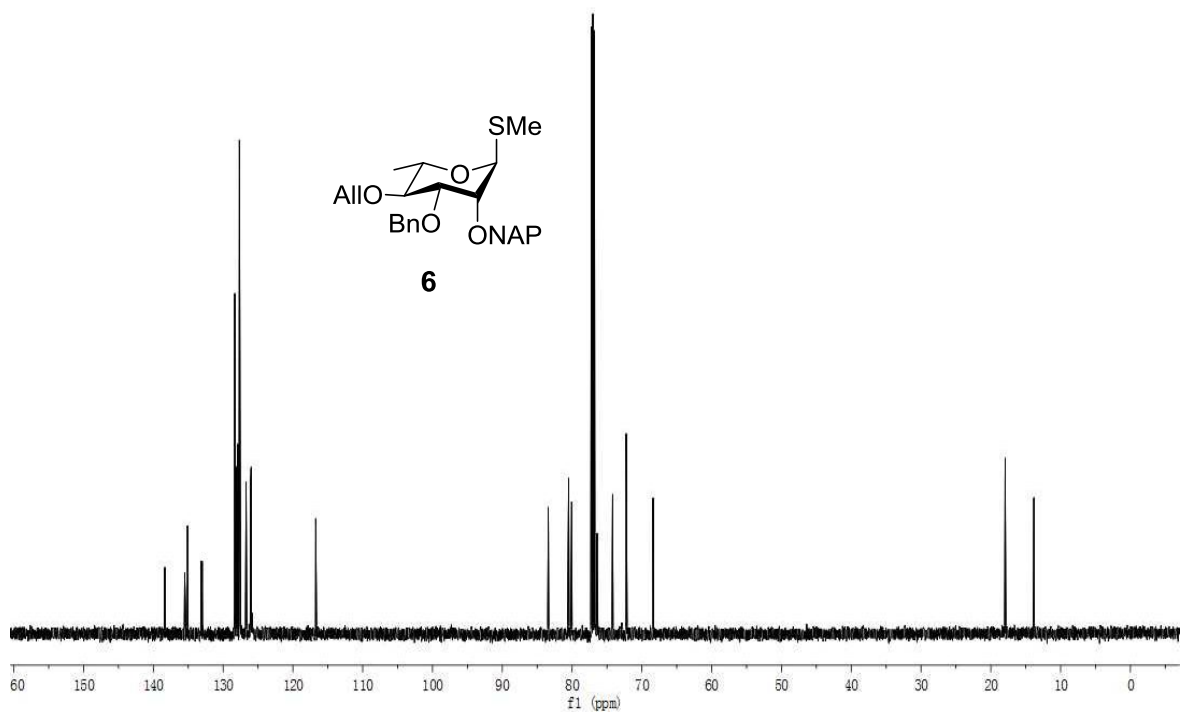
^{13}C NMR spectrum of compound **5** (150 MHz, CDCl_3 , 25 °C)



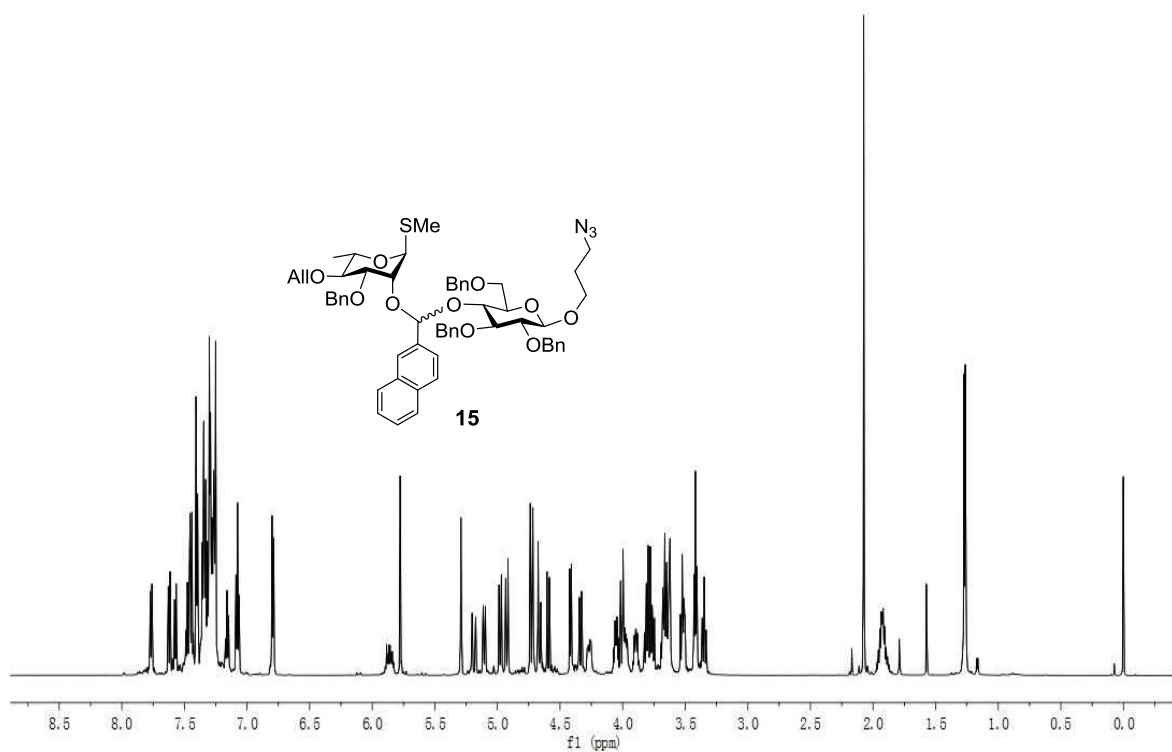




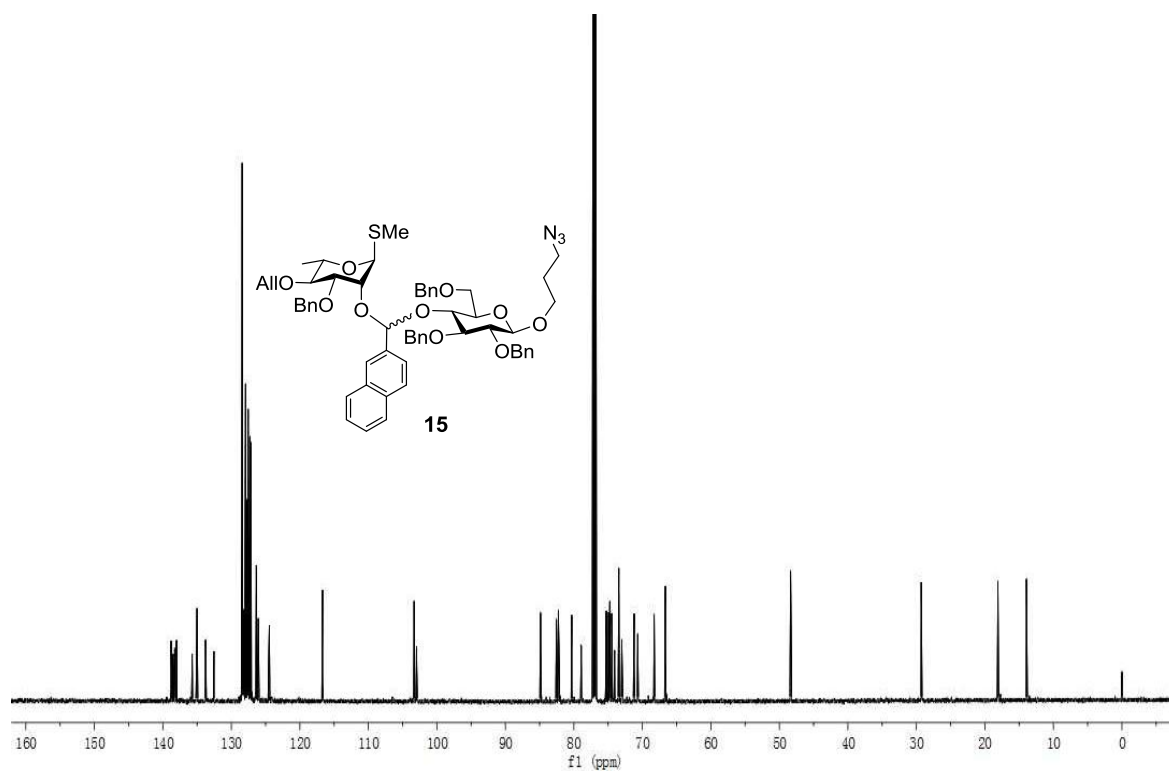
^1H NMR spectrum of compound **6** (600 MHz, CDCl_3 , 25 °C)



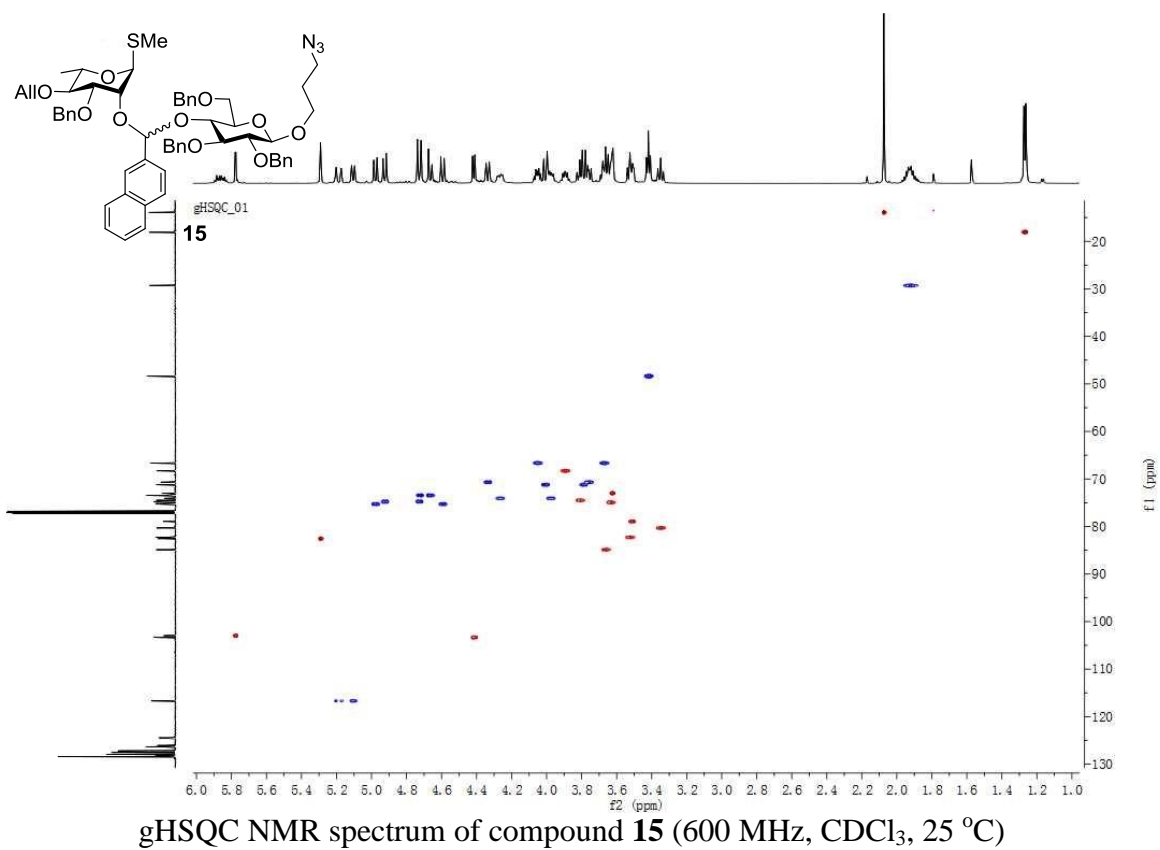
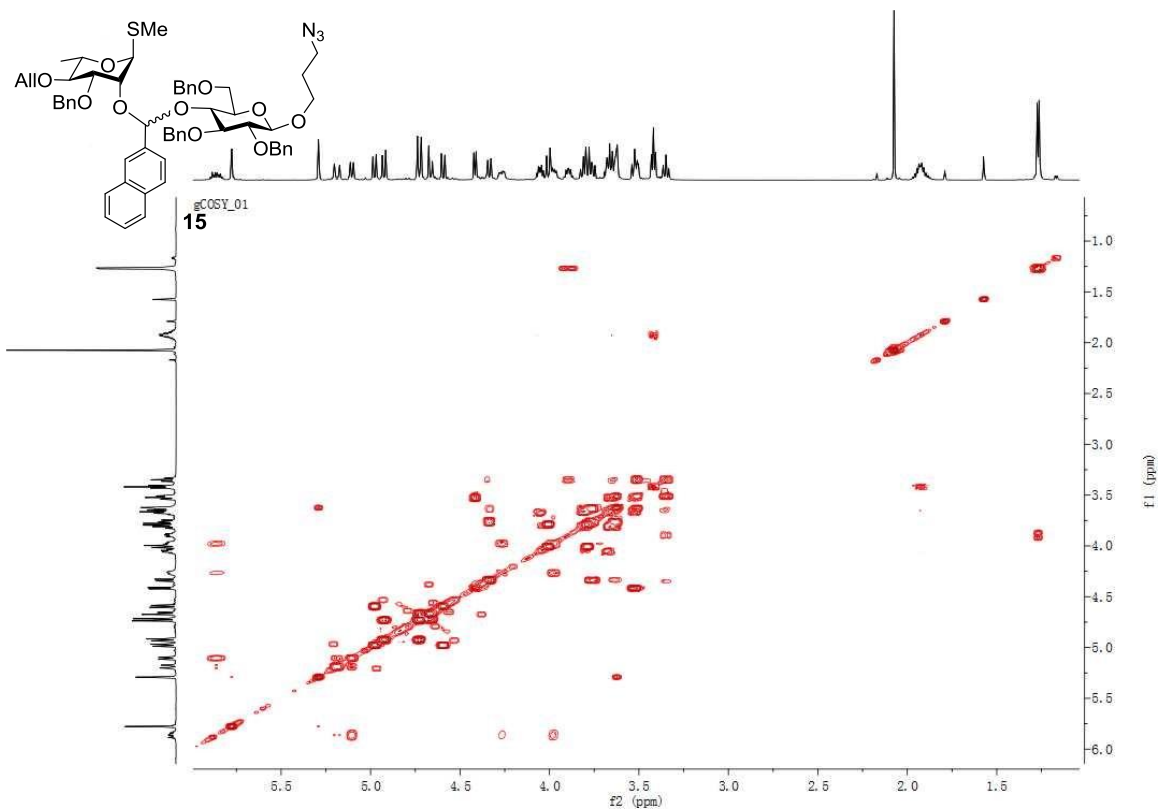
^{13}C NMR spectrum of compound **6** (150 MHz, CDCl_3 , 25 °C)

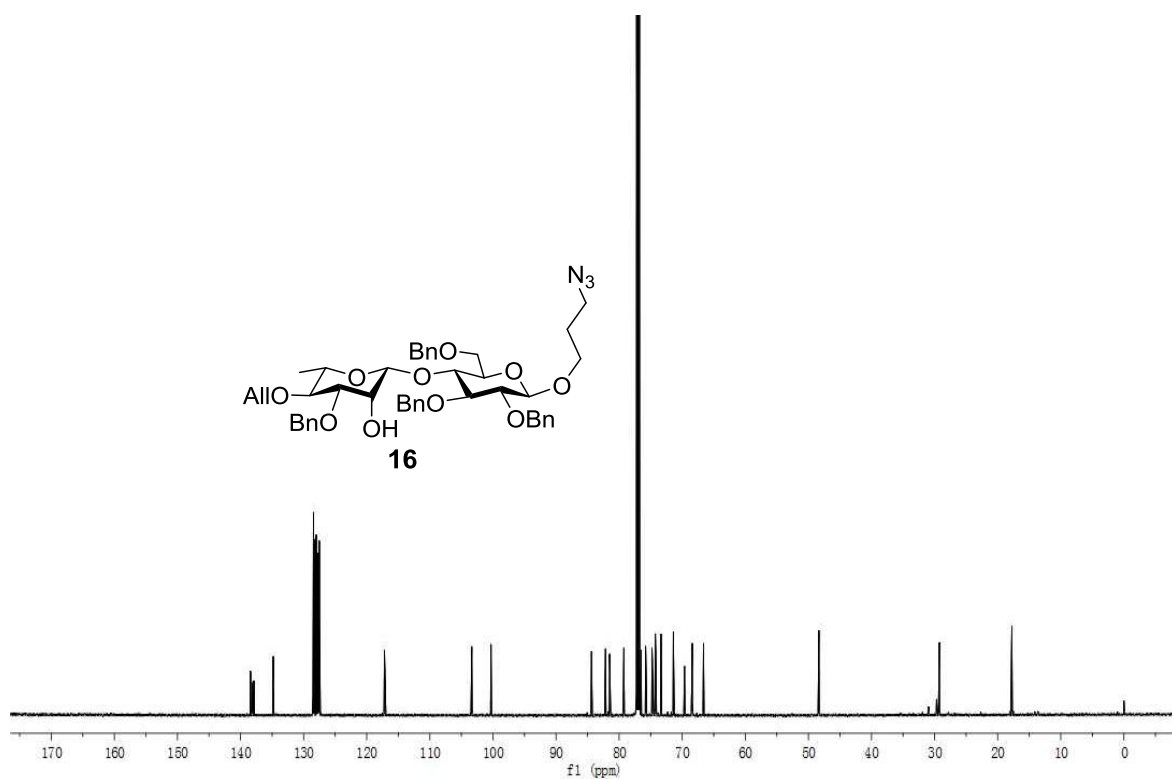
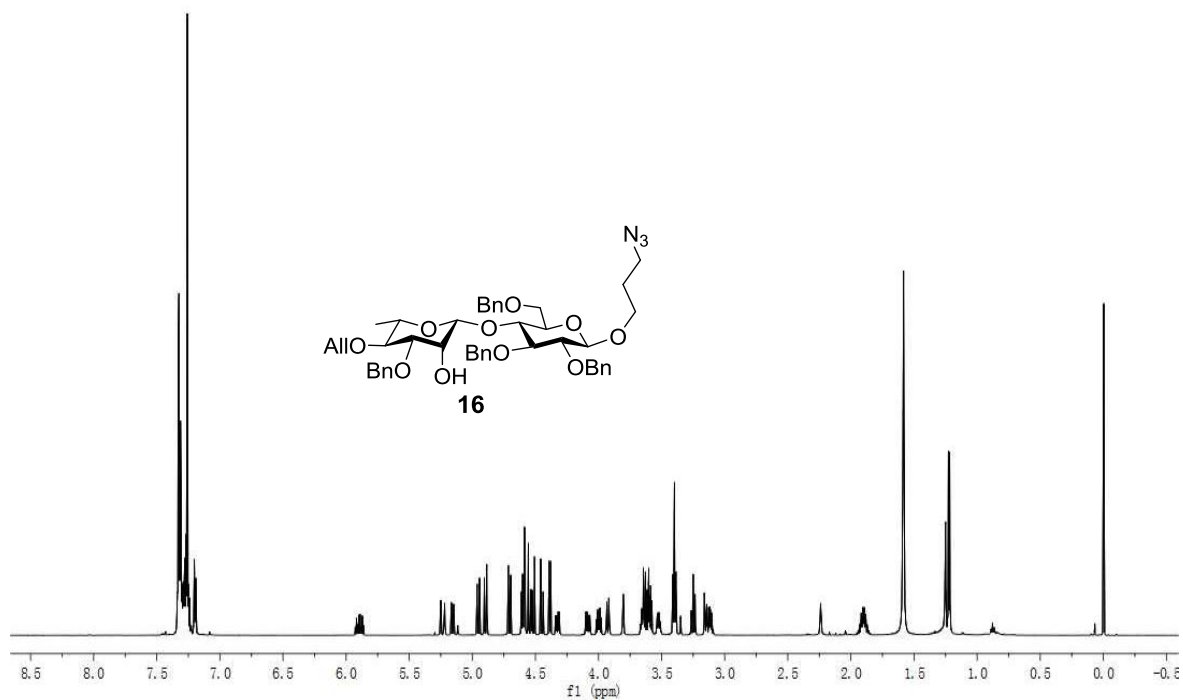


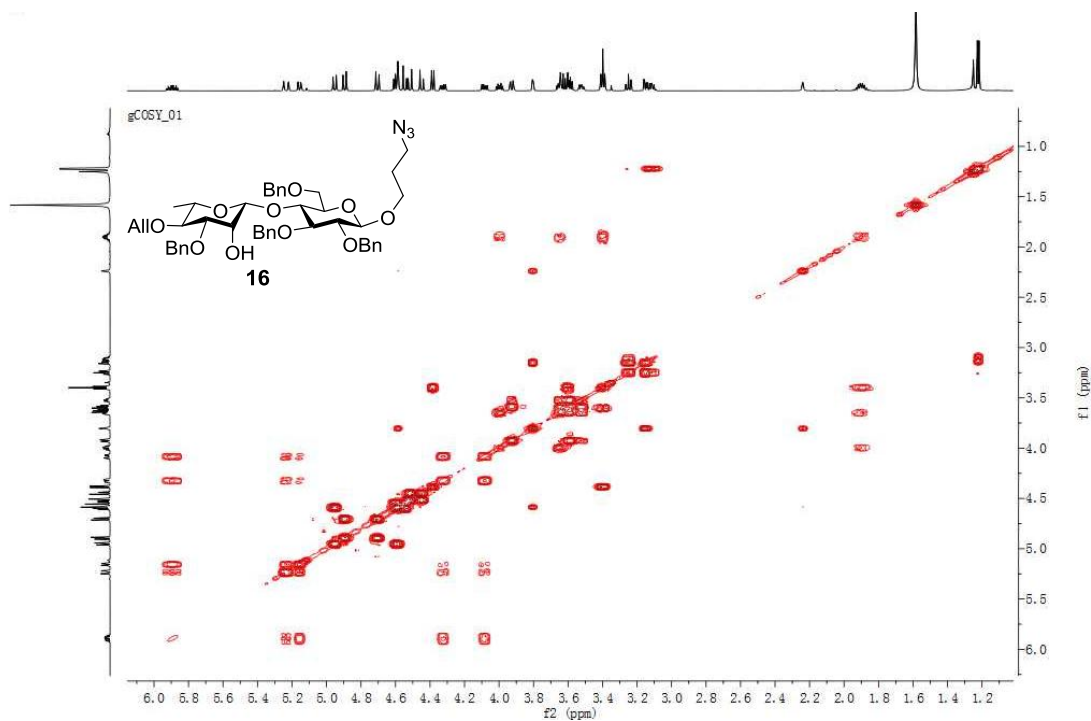
^1H NMR spectrum of compound **15** (600 MHz, CDCl_3 , 25 °C)



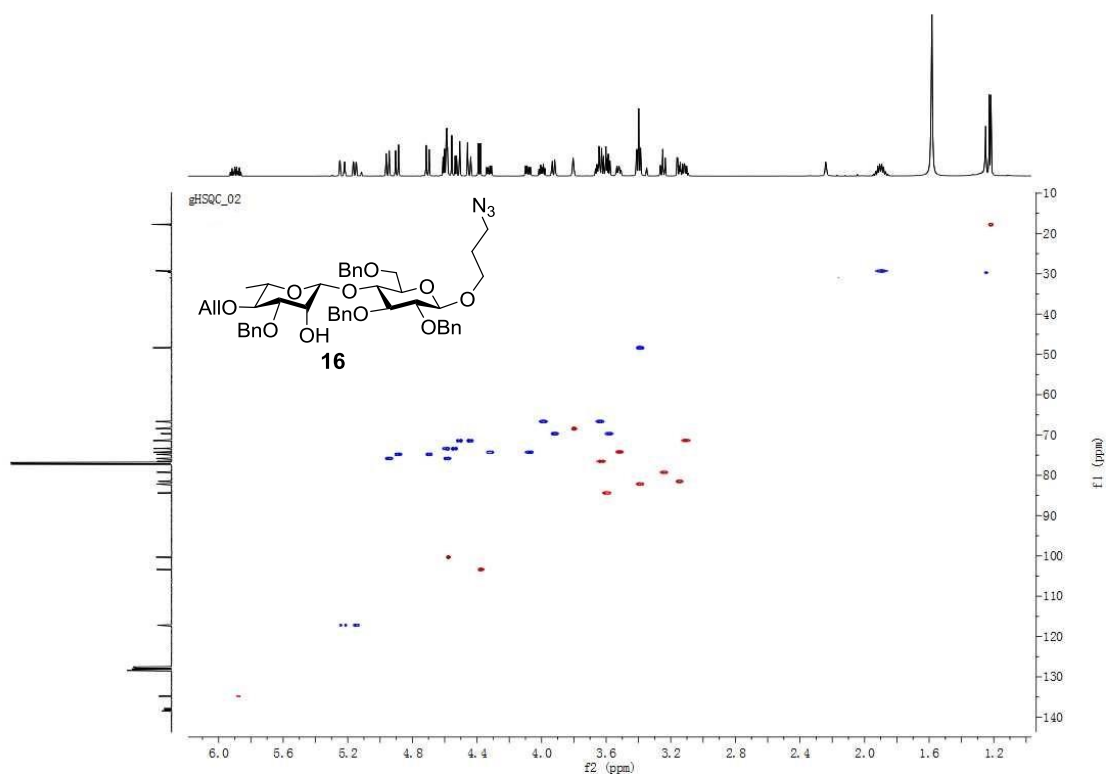
^{13}C NMR spectrum of compound **15** (150 MHz, CDCl_3 , 25 °C)



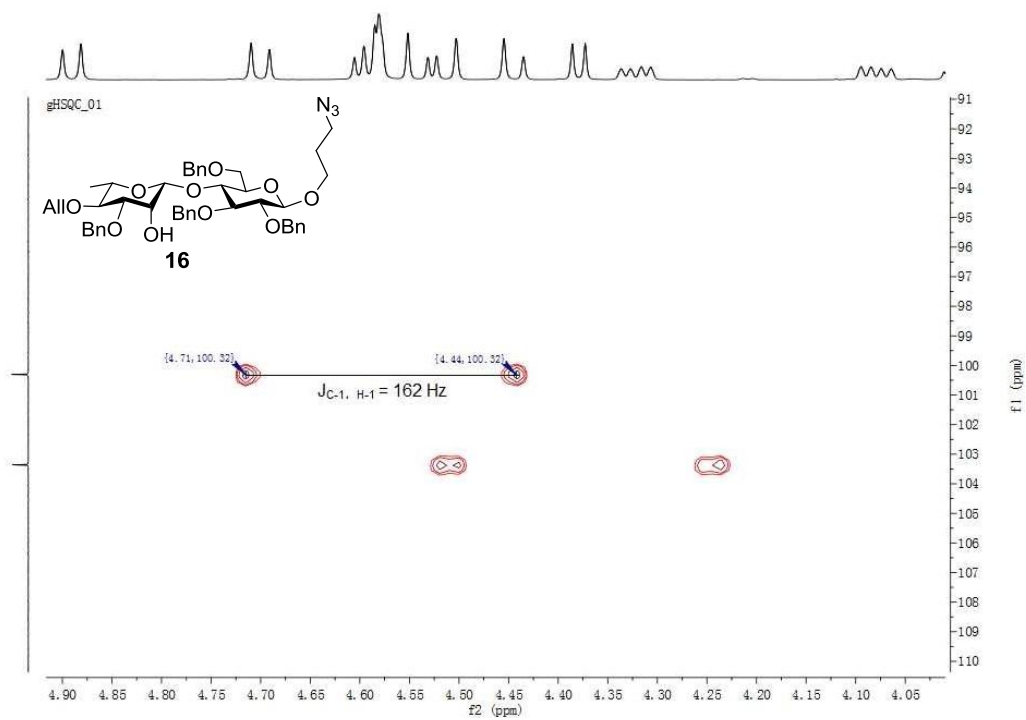




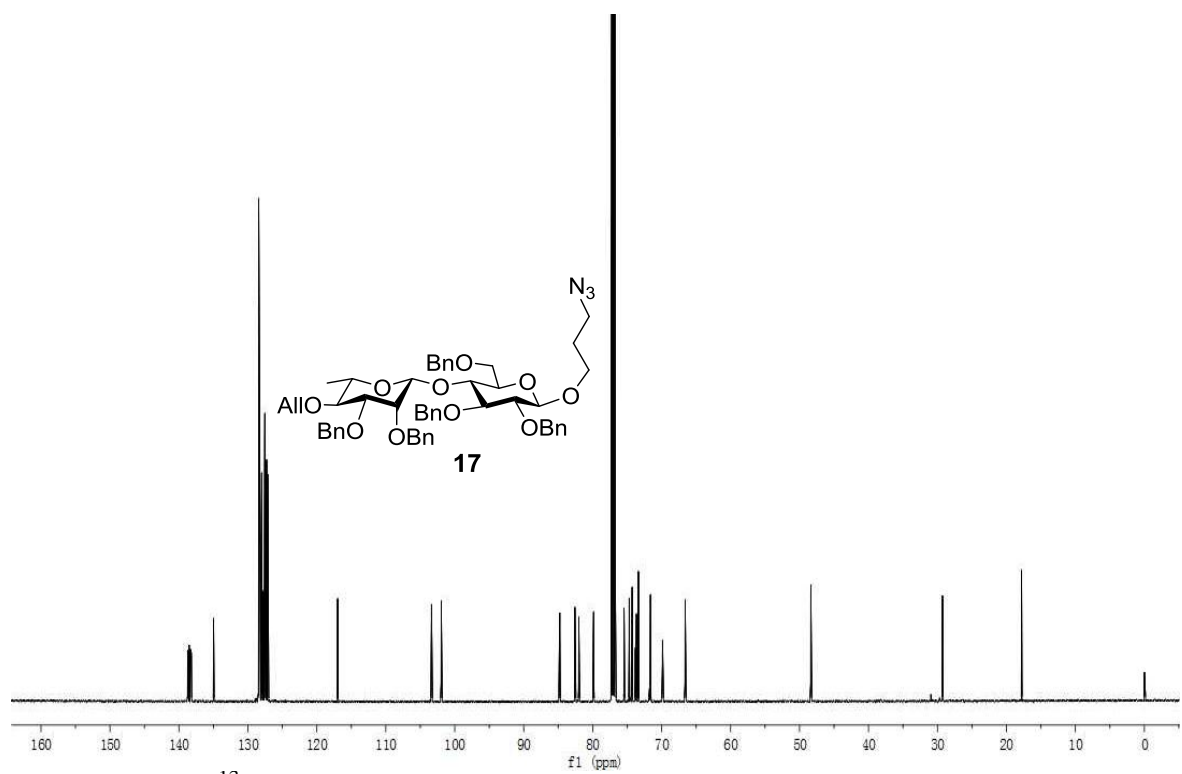
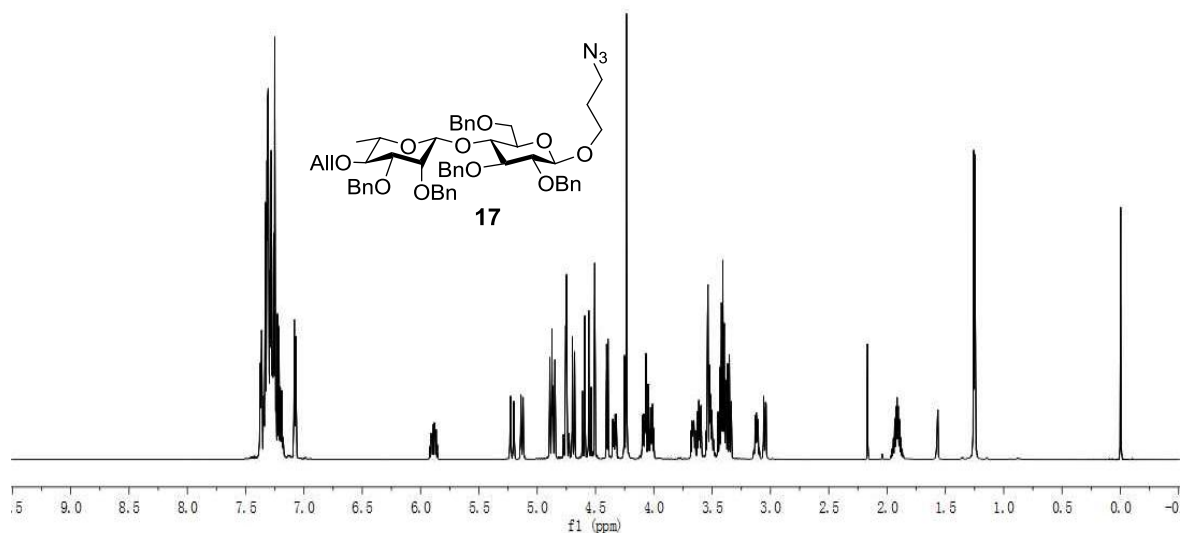
gCOSY NMR spectrum of compound **16** (600 MHz, CDCl₃, 25 °C)

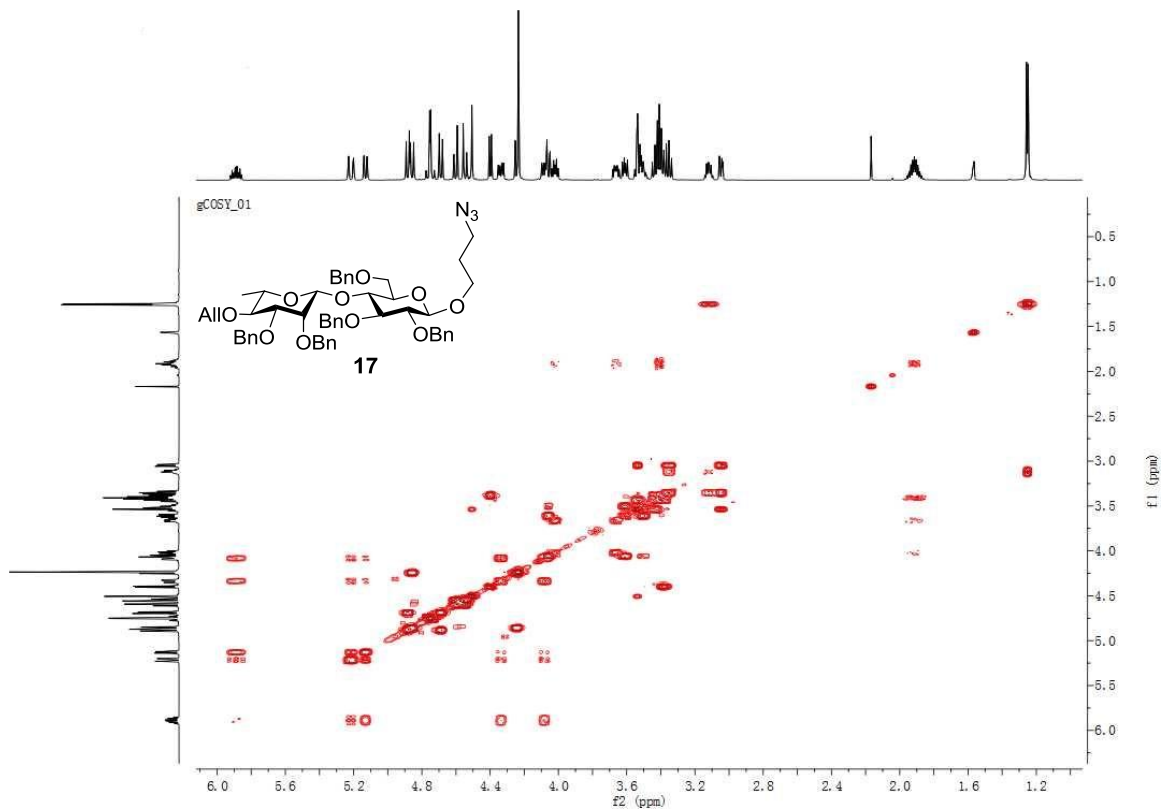


gHSQC NMR spectrum of compound **16** (600 MHz, CDCl₃, 25 °C)

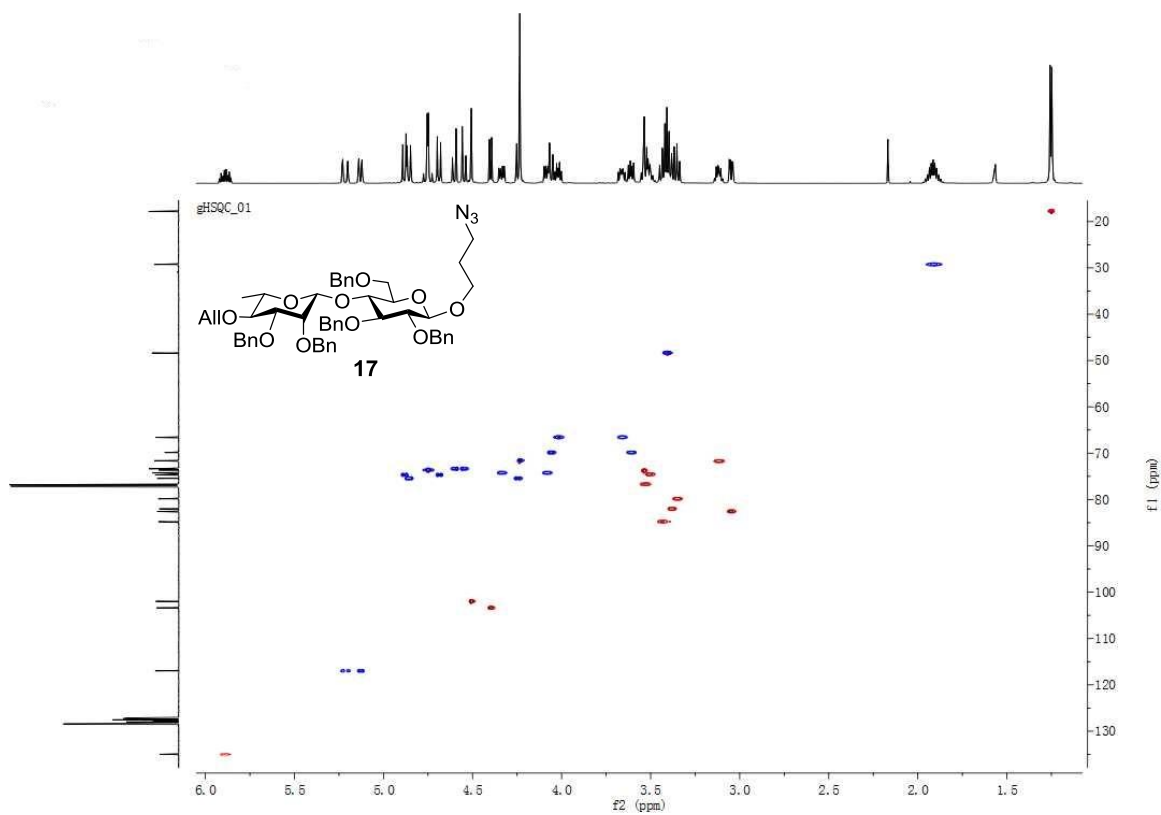


¹H-Coupled gHSQC NMR spectrum of compound **16** (600 MHz, CDCl₃, 25 °C)

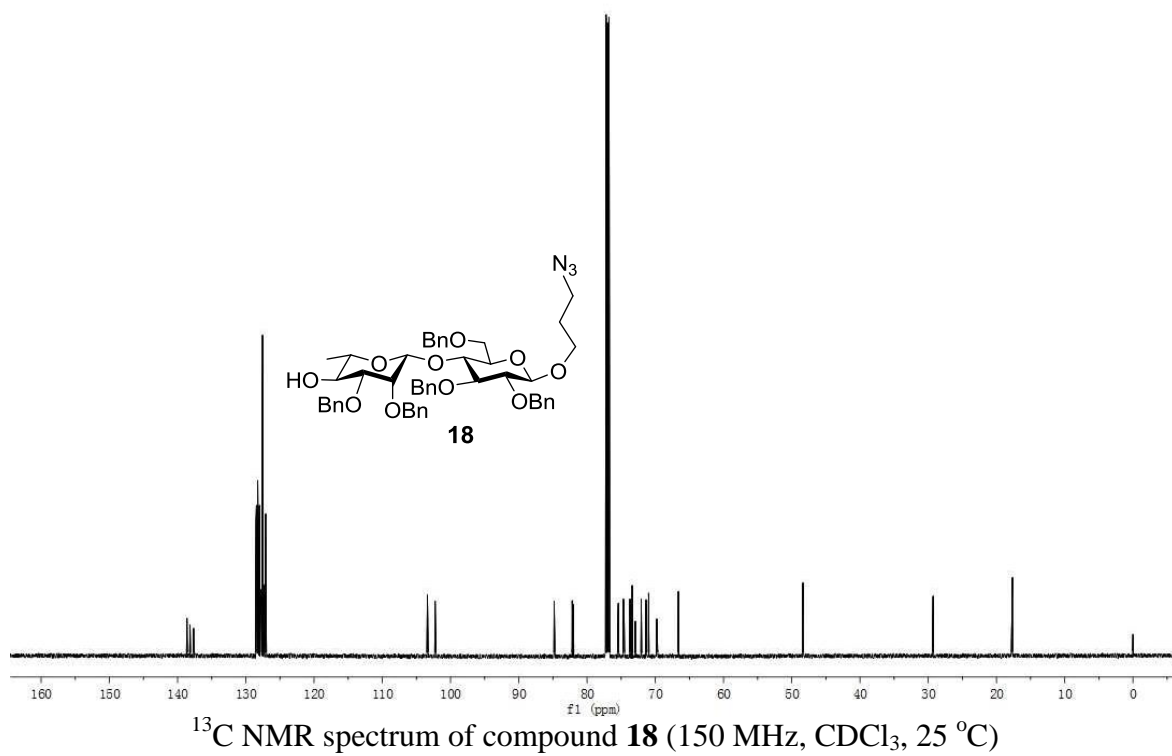
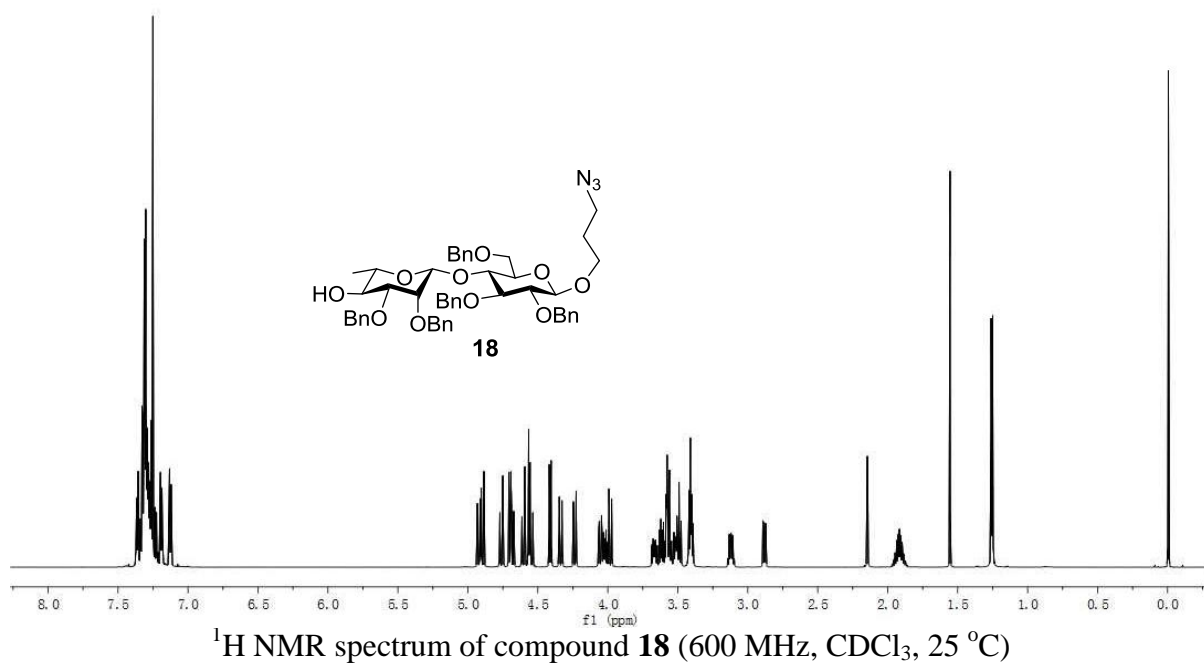


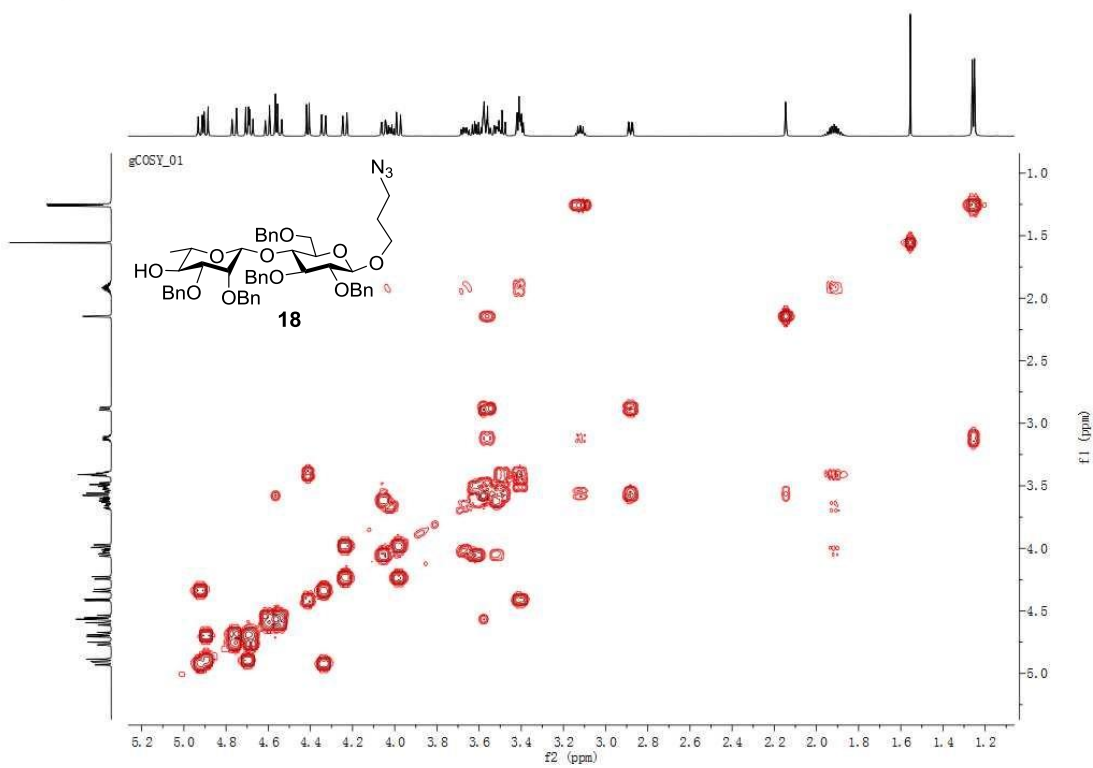


gCOSY NMR spectrum of compound **17** (600 MHz, CDCl₃, 25 °C)

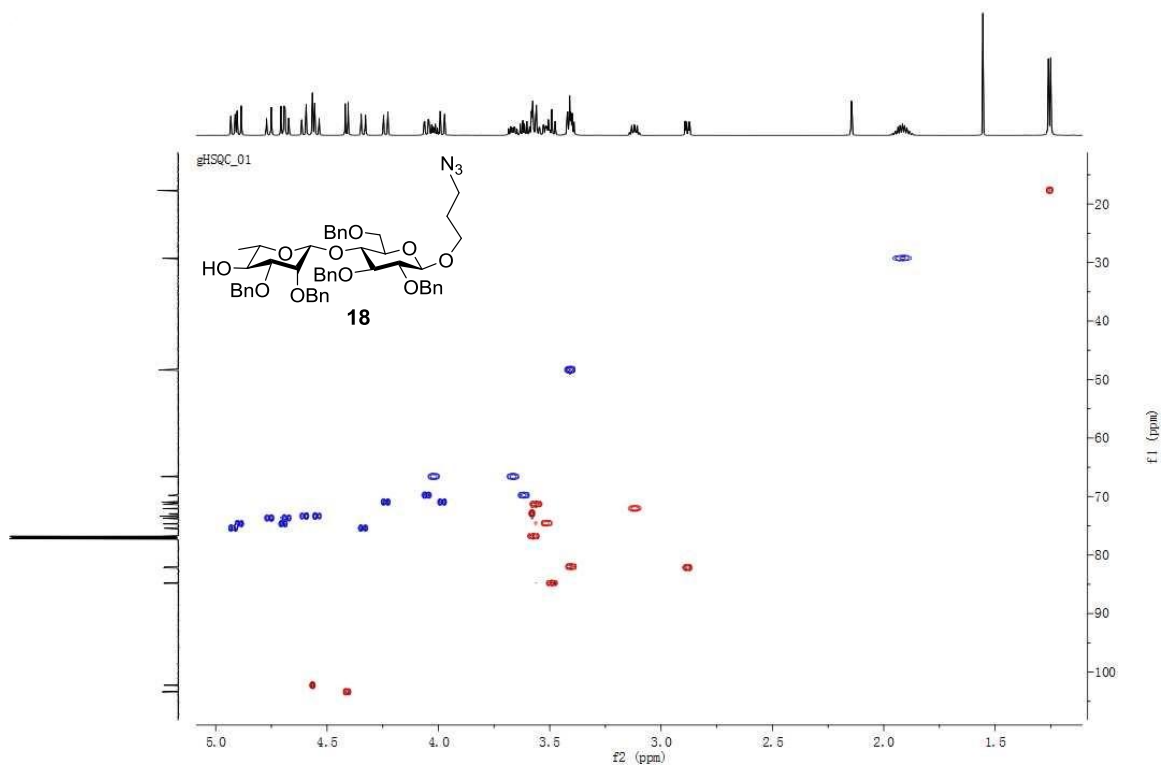


gHSQC NMR spectrum of compound **17** (600 MHz, CDCl₃, 25 °C)

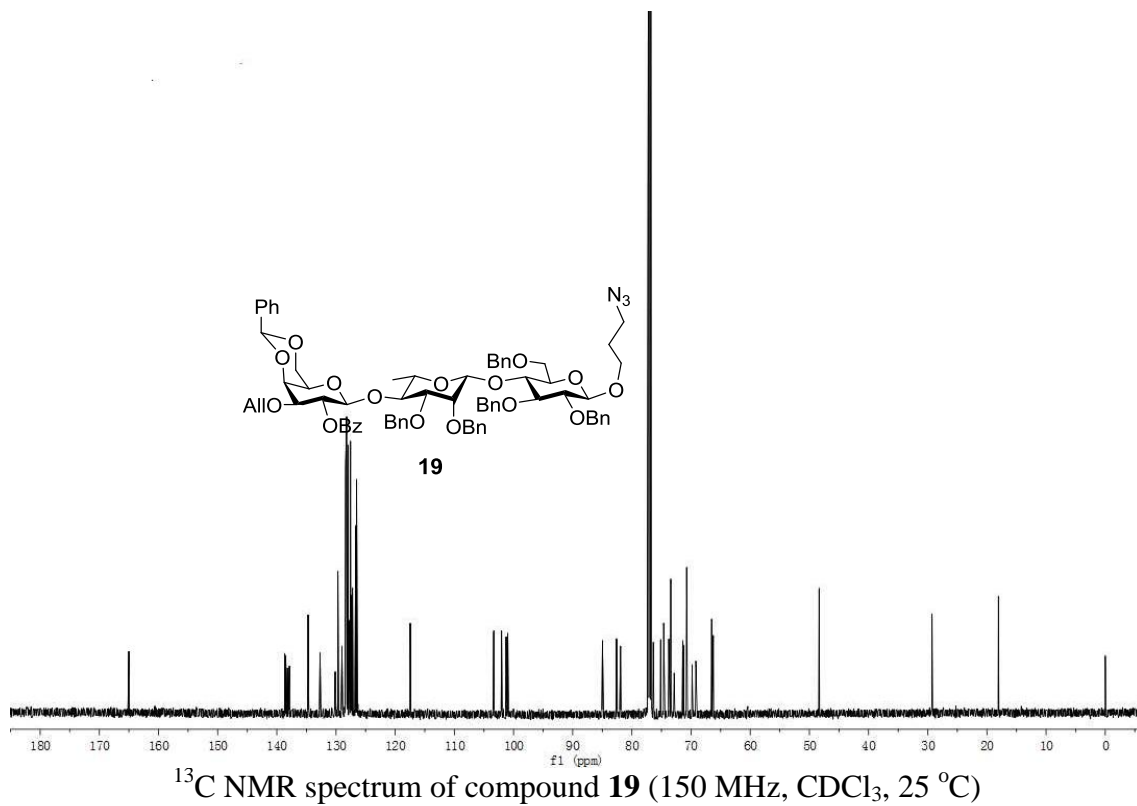
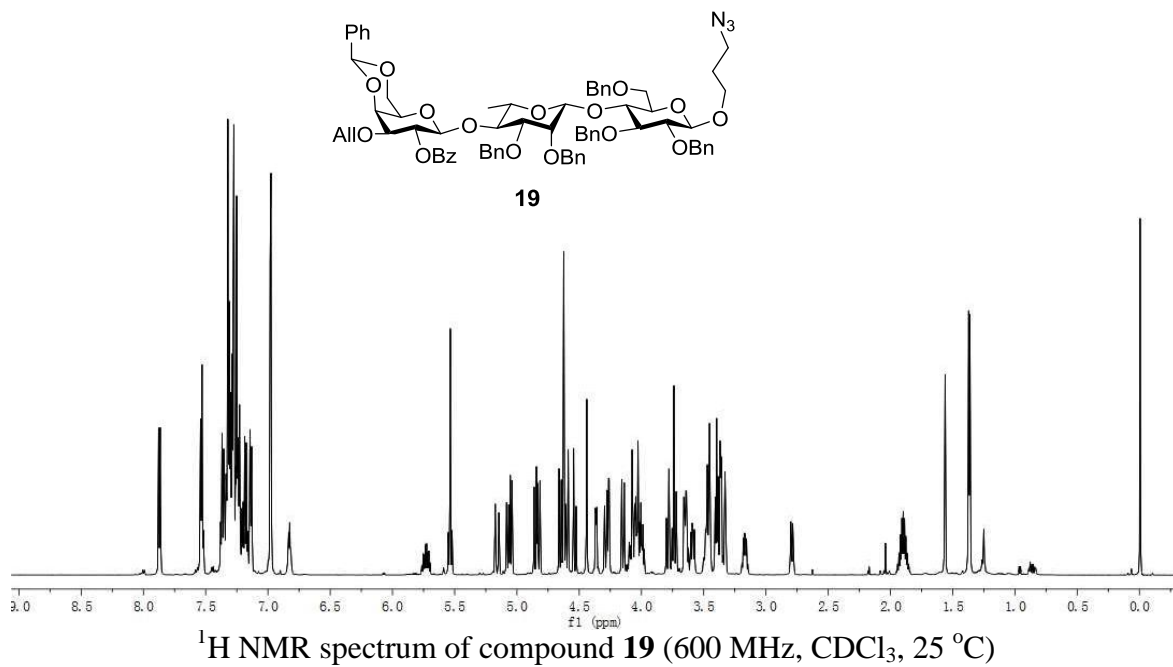


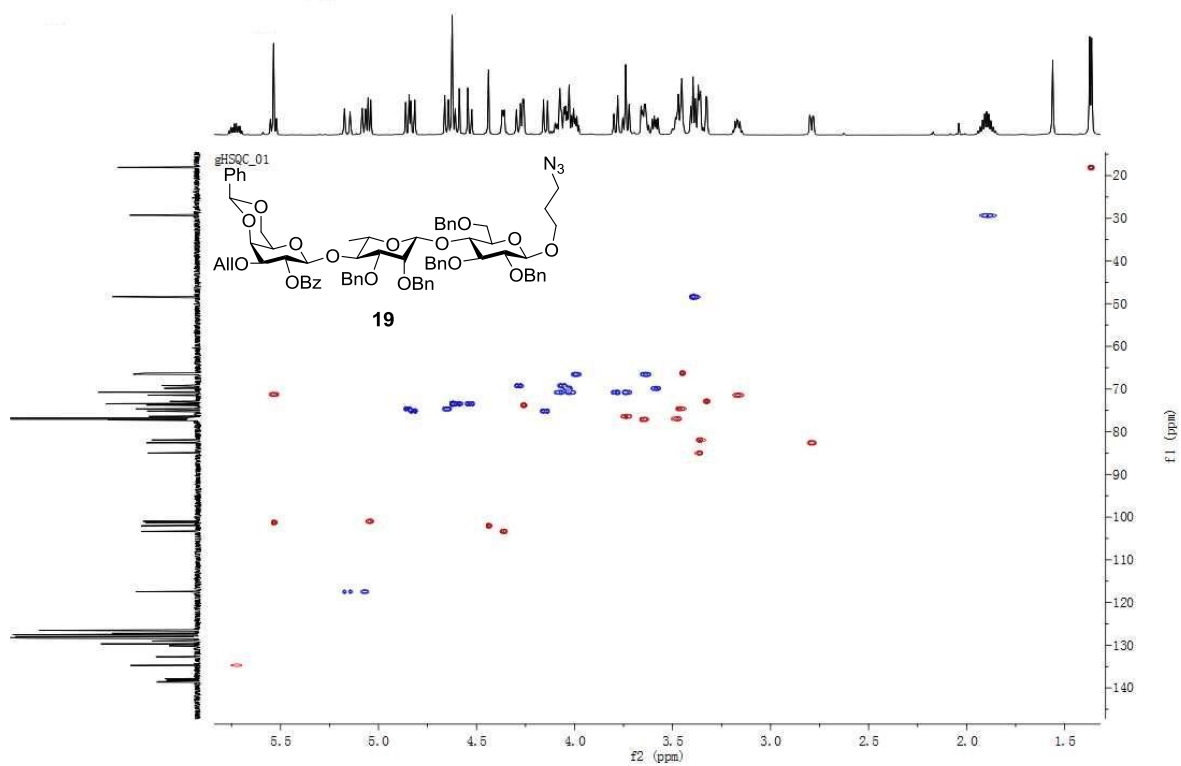
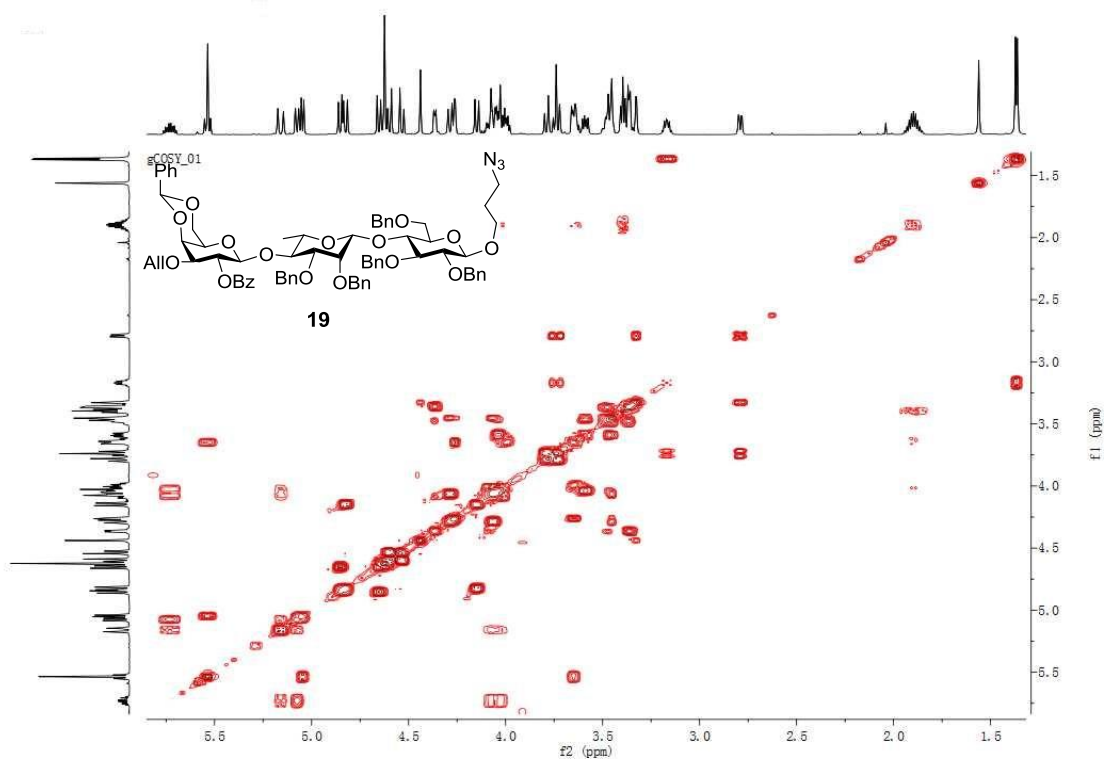


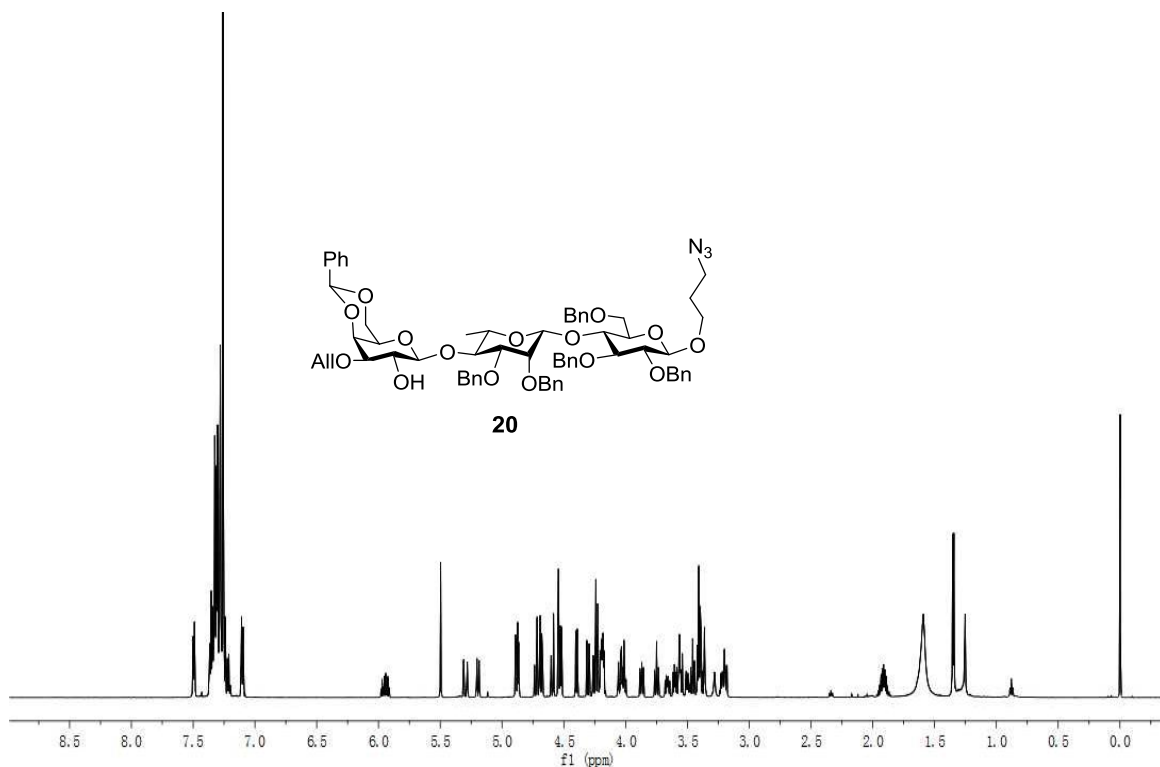
gCOSY NMR spectrum of compound **18** (600 MHz, CDCl₃, 25 °C)



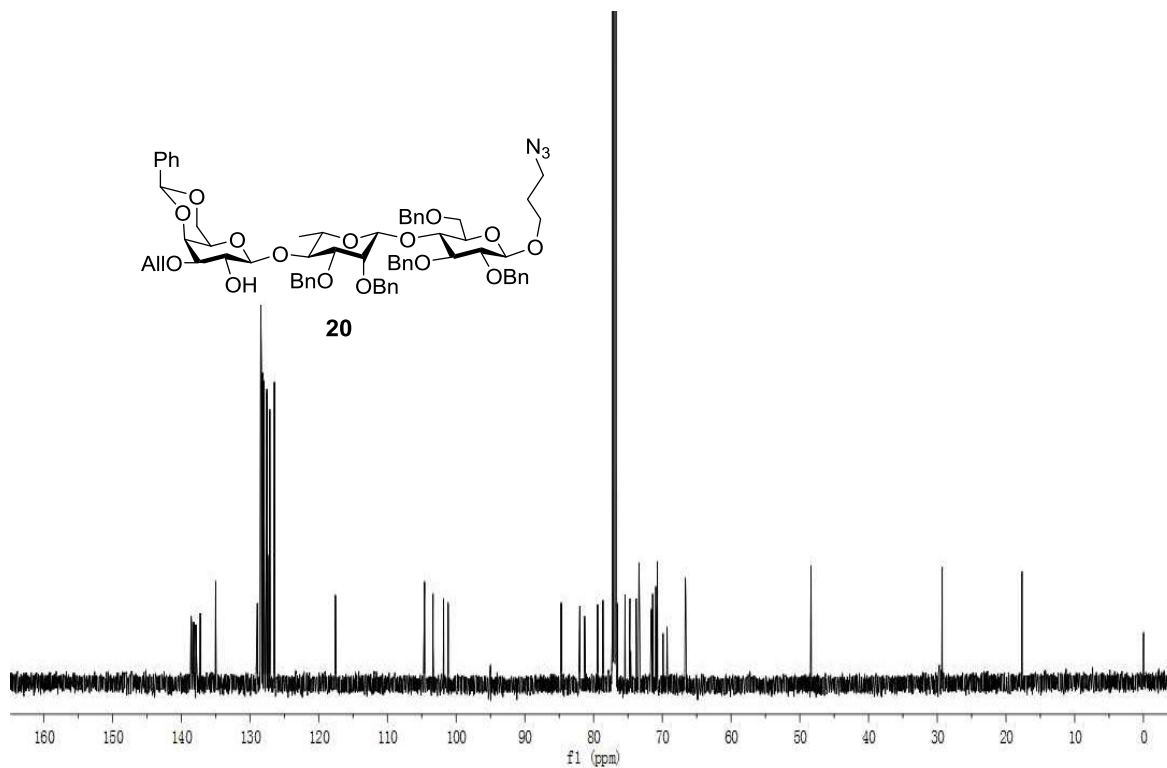
gHSQC NMR spectrum of compound **18** (600 MHz, CDCl₃, 25 °C)



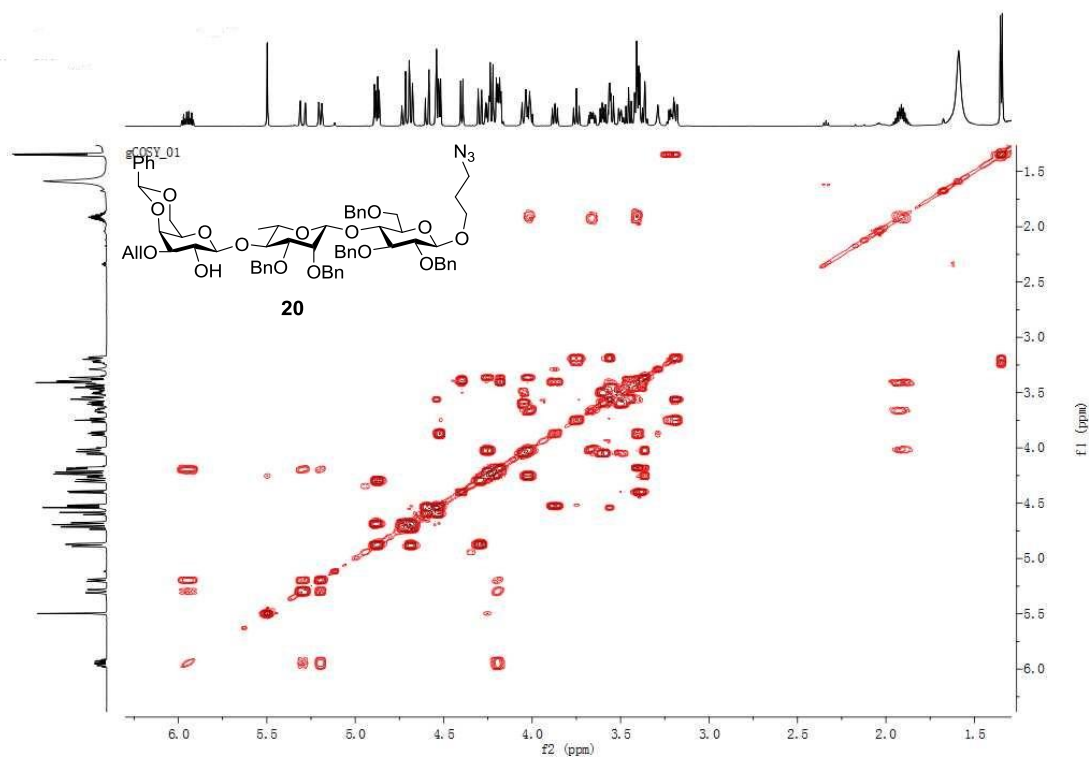




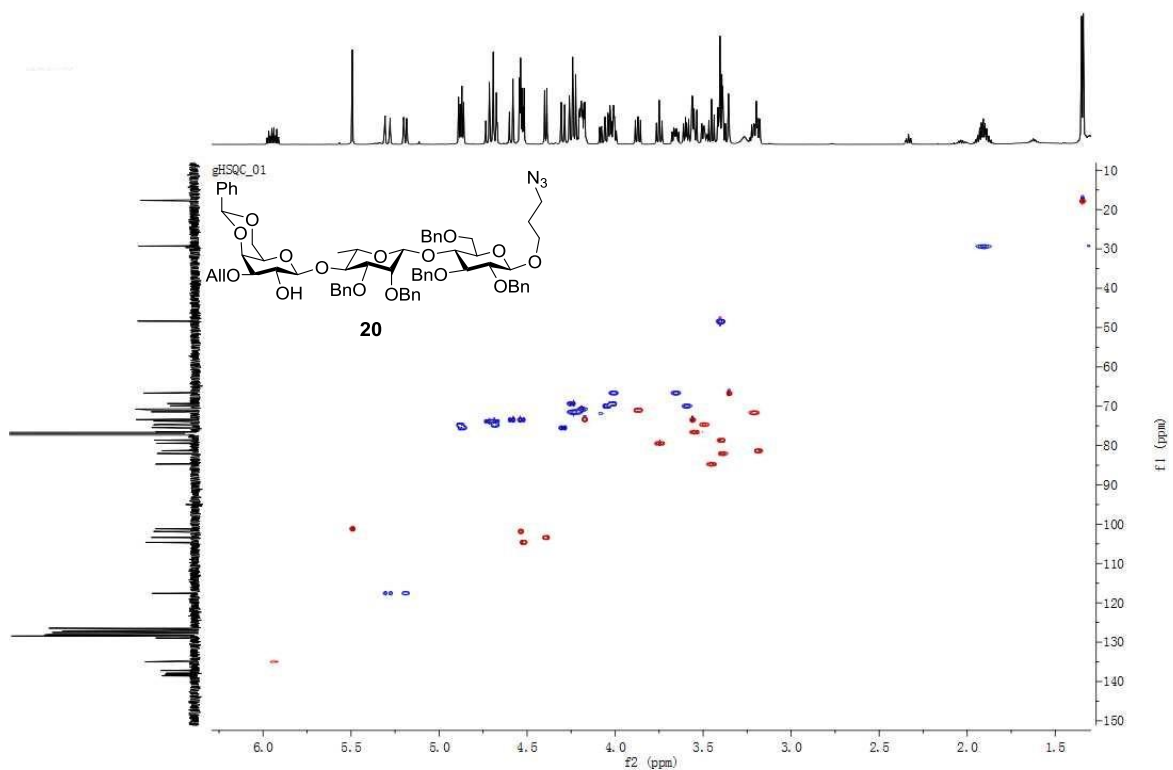
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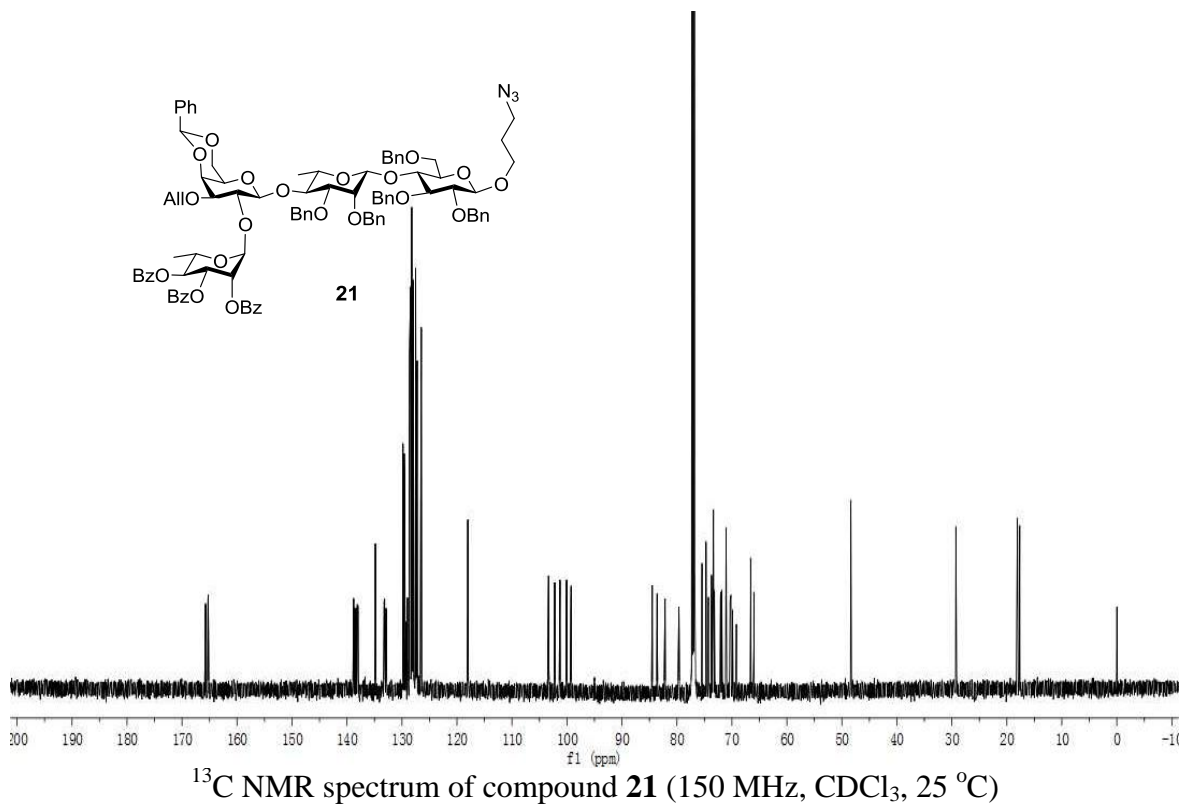
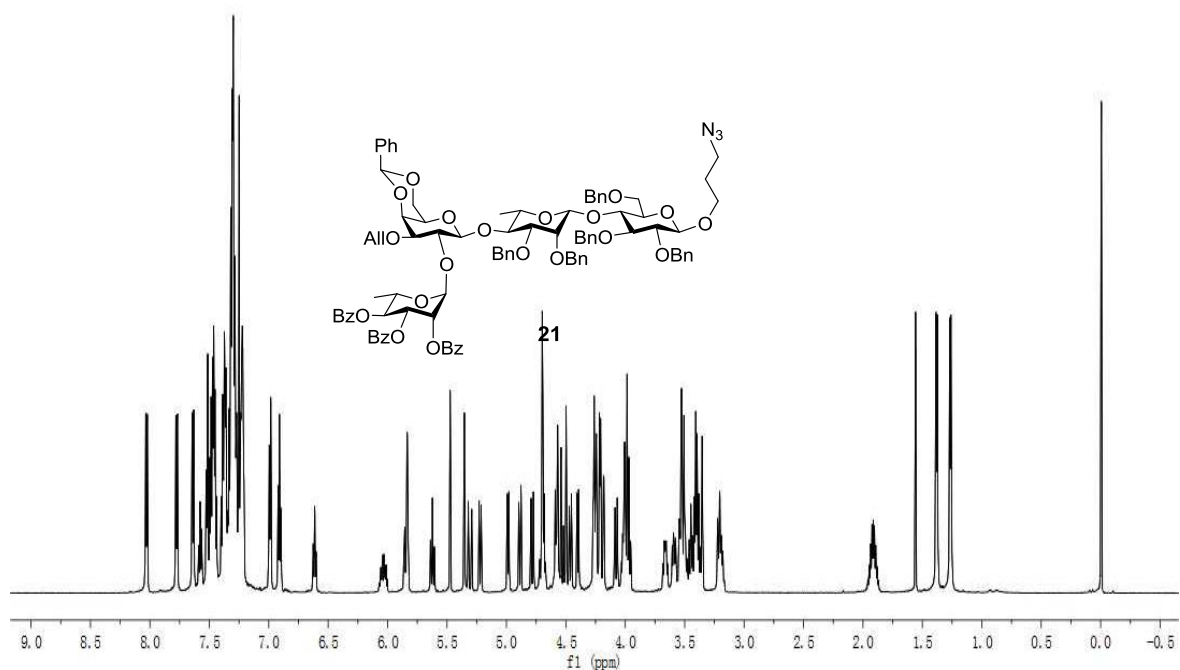
¹³C NMR spectrum of compound **20** (150 MHz, CDCl₃, 25 °C)

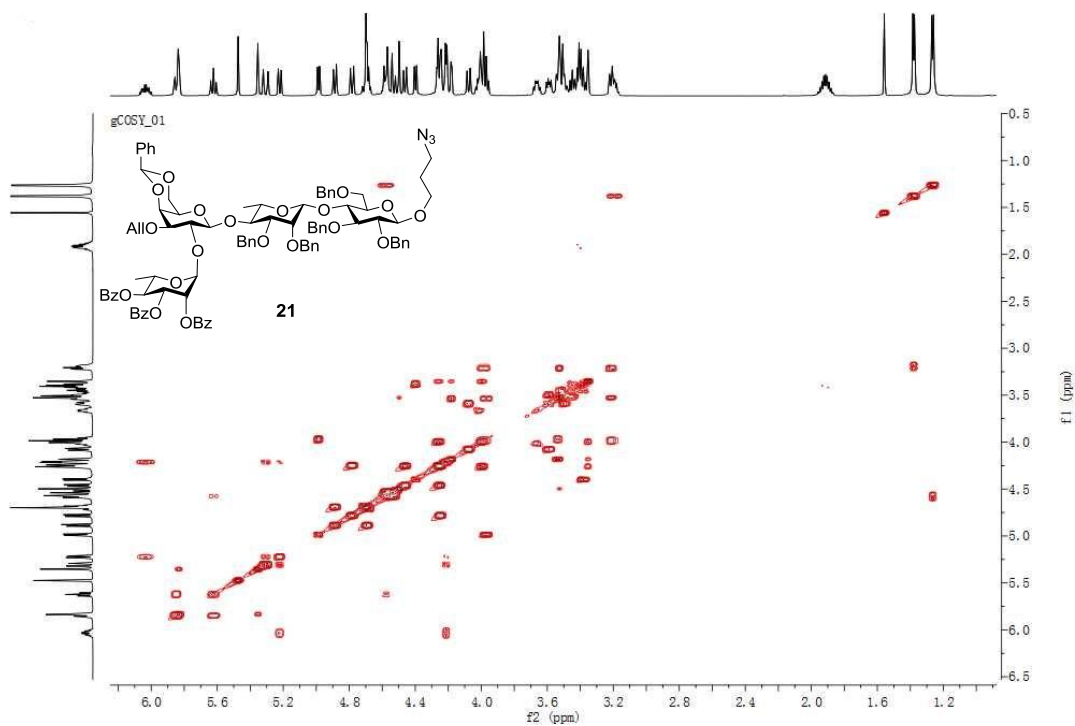


gCOSY NMR spectrum of compound **20** (600 MHz, CDCl₃, 25 °C)

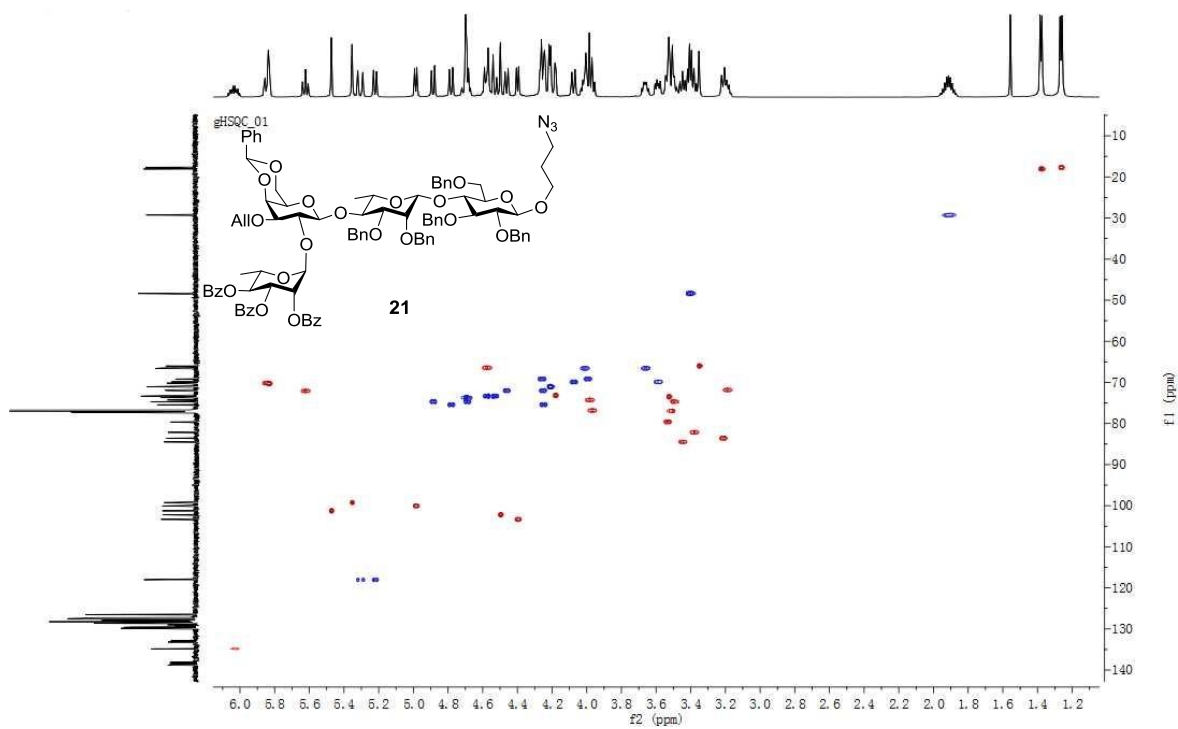


gHSQC NMR spectrum of compound **20** (600 MHz, CDCl₃, 25 °C)

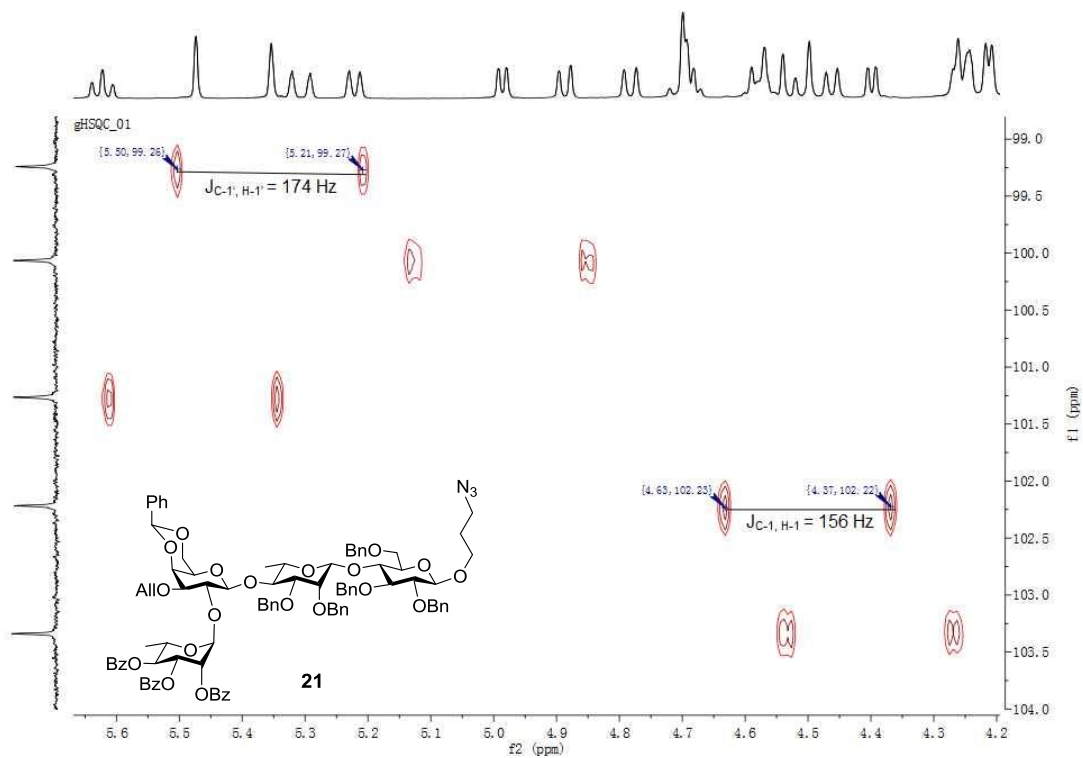




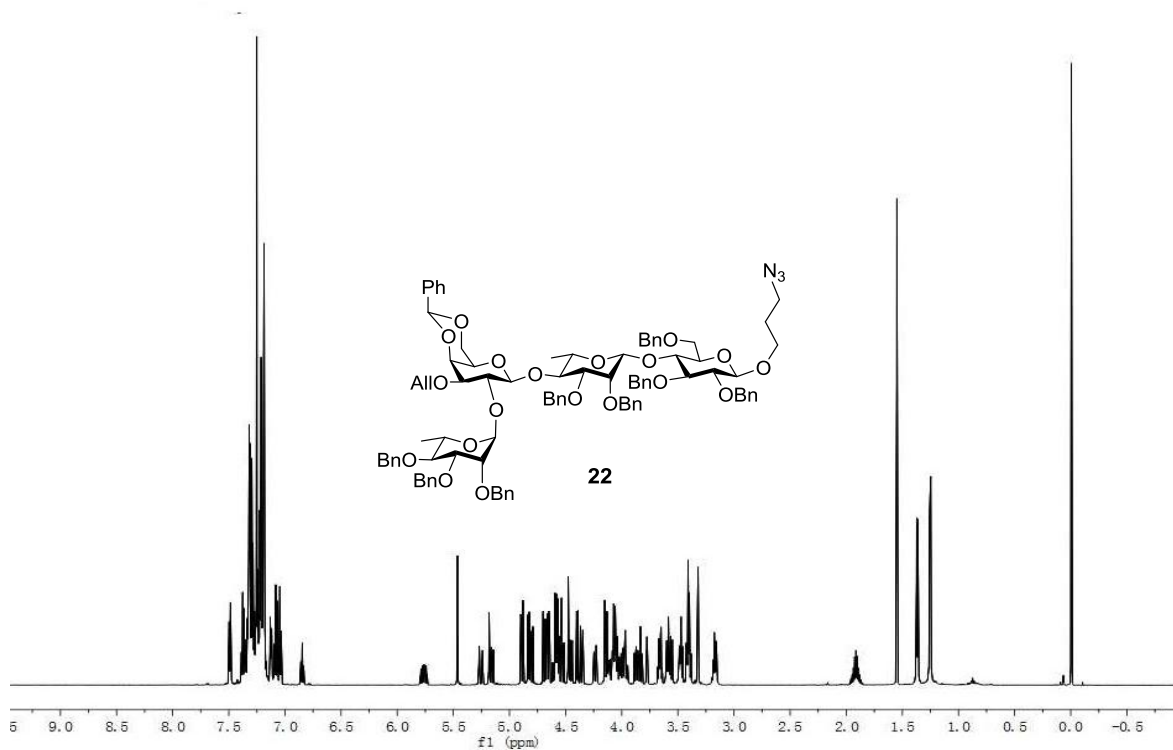
gCOSY NMR spectrum of compound **21** (600 MHz, CDCl₃, 25 °C)



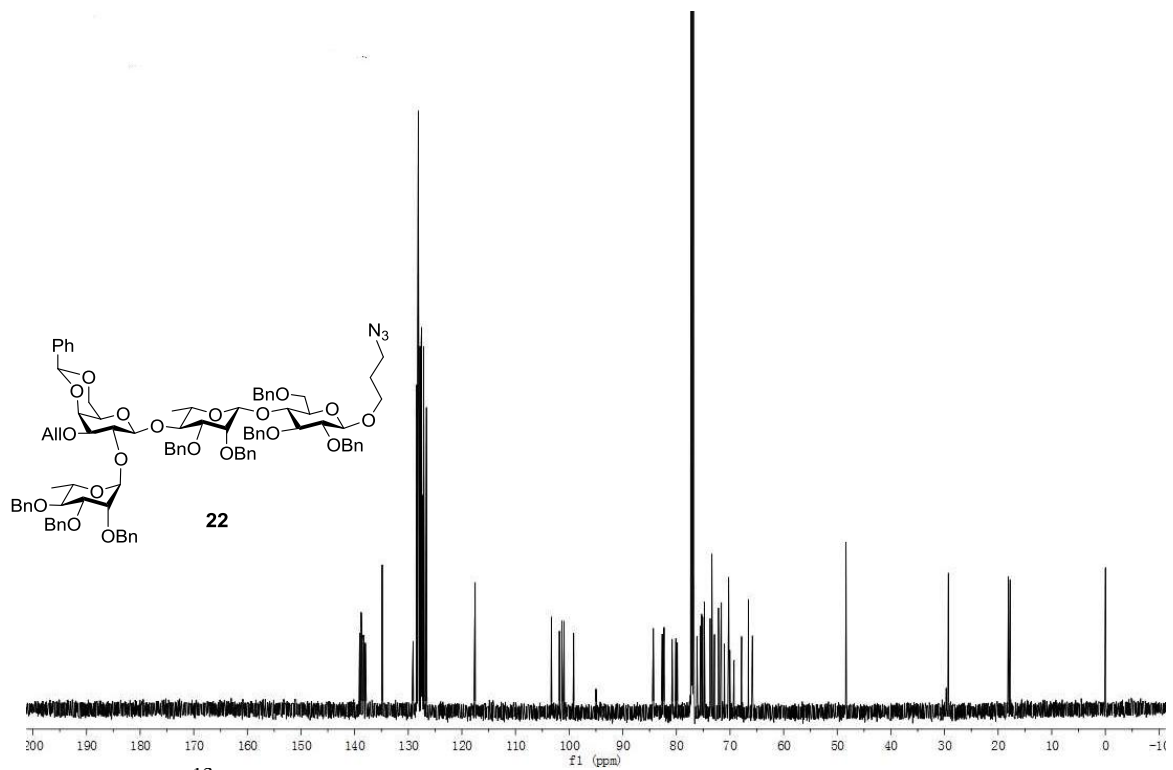
gHSQC NMR spectrum of compound **21** (600 MHz, CDCl₃, 25 °C)



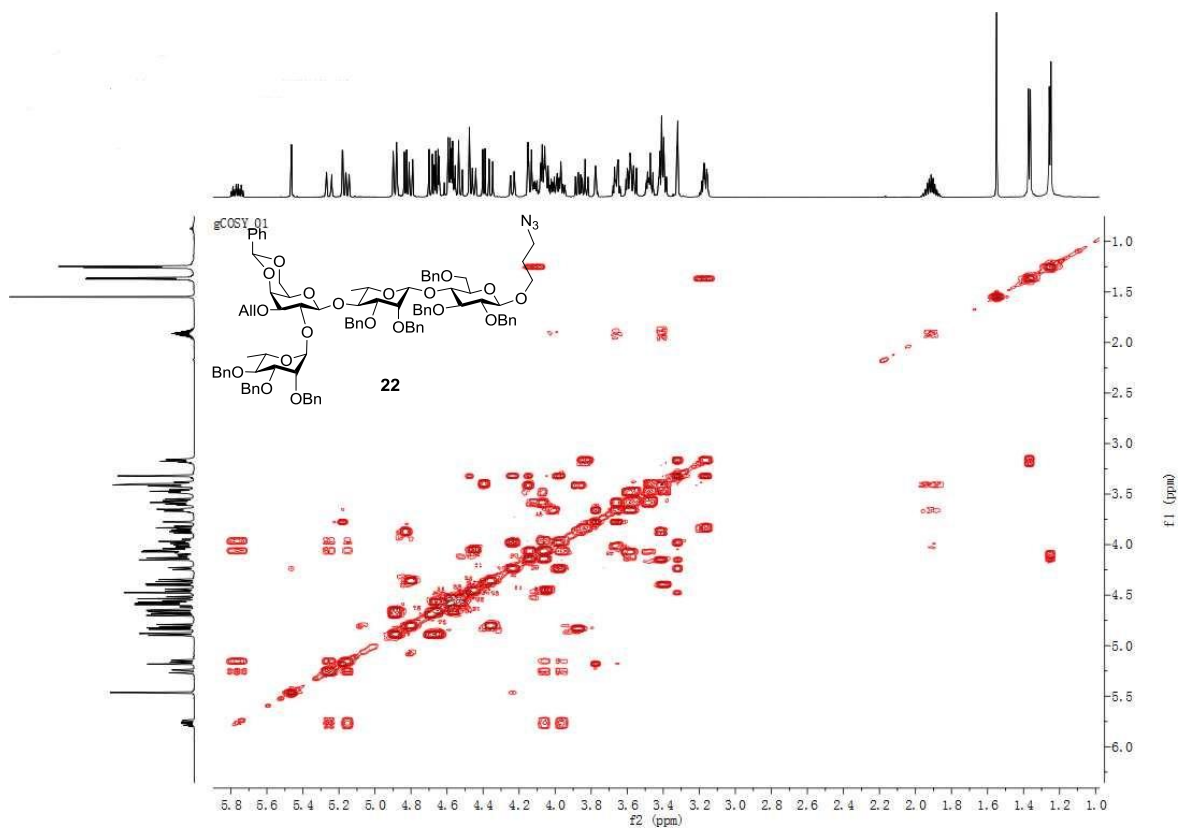
¹H-Coupled gHSQC NMR spectrum of compound **21** (600 MHz, CDCl₃, 25 °C)



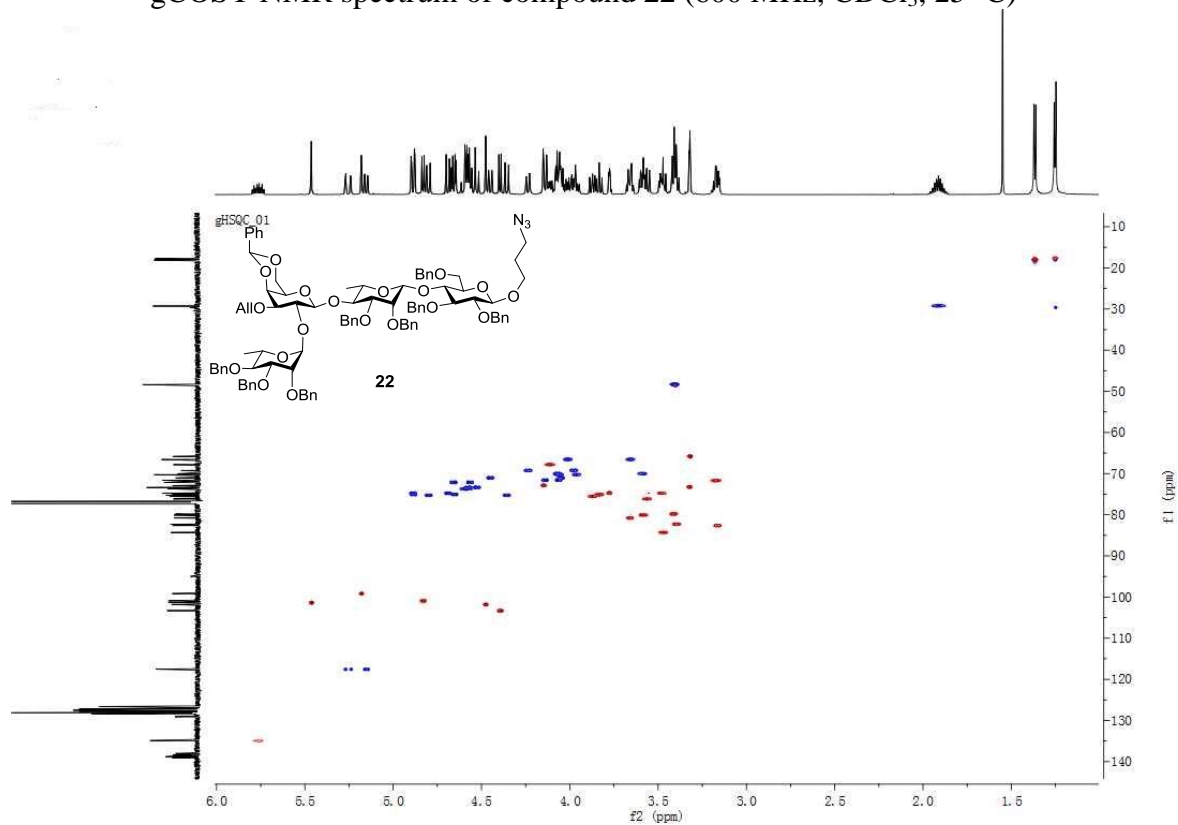
¹H NMR spectrum of compound 22 (600 MHz, CDCl₃, 25 °C)



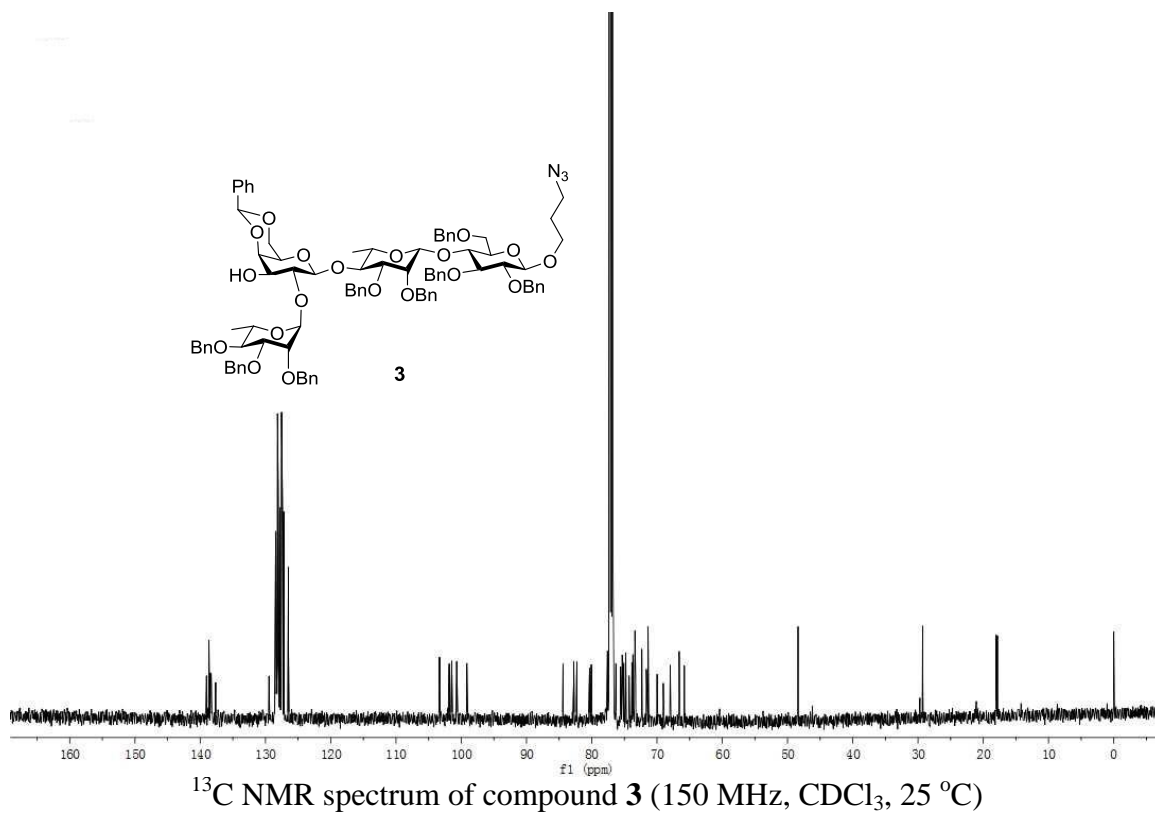
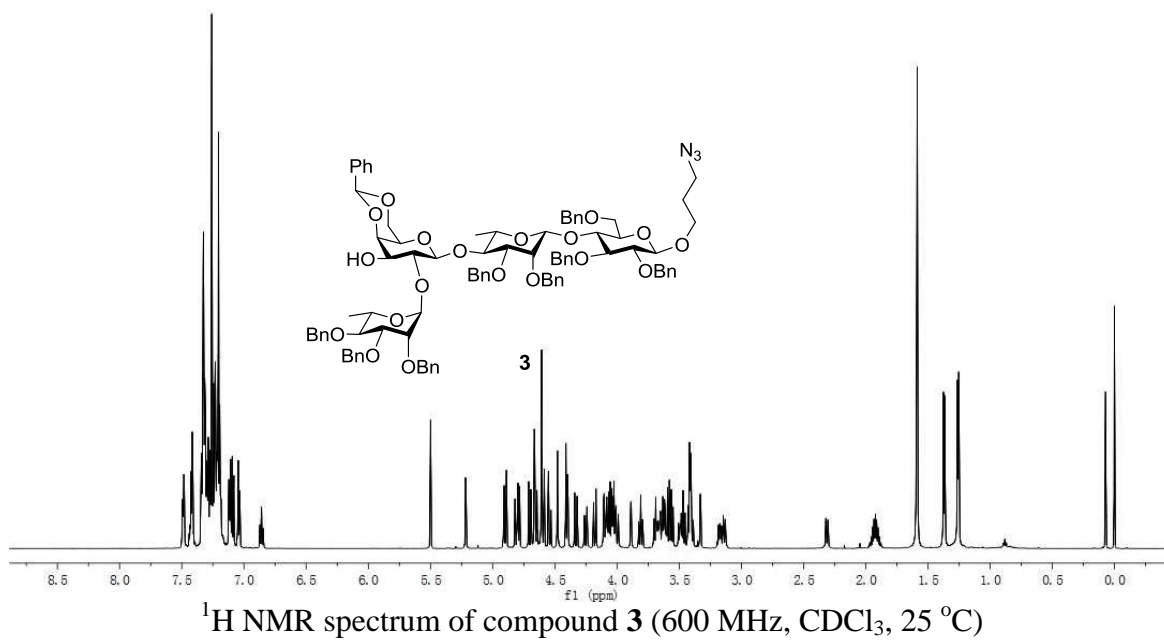
¹³C NMR spectrum of compound 22 (150 MHz, CDCl₃, 25 °C)

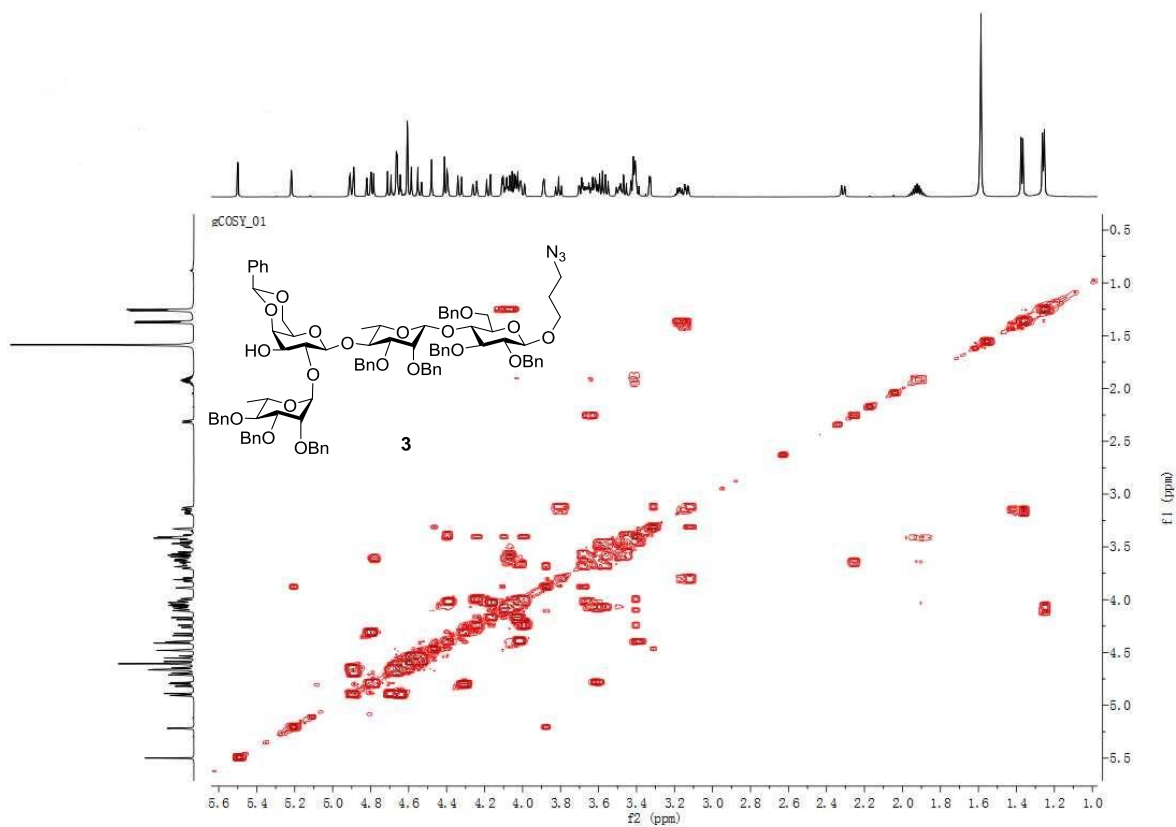


gCOSY NMR spectrum of compound **22** (600 MHz, CDCl₃, 25 °C)

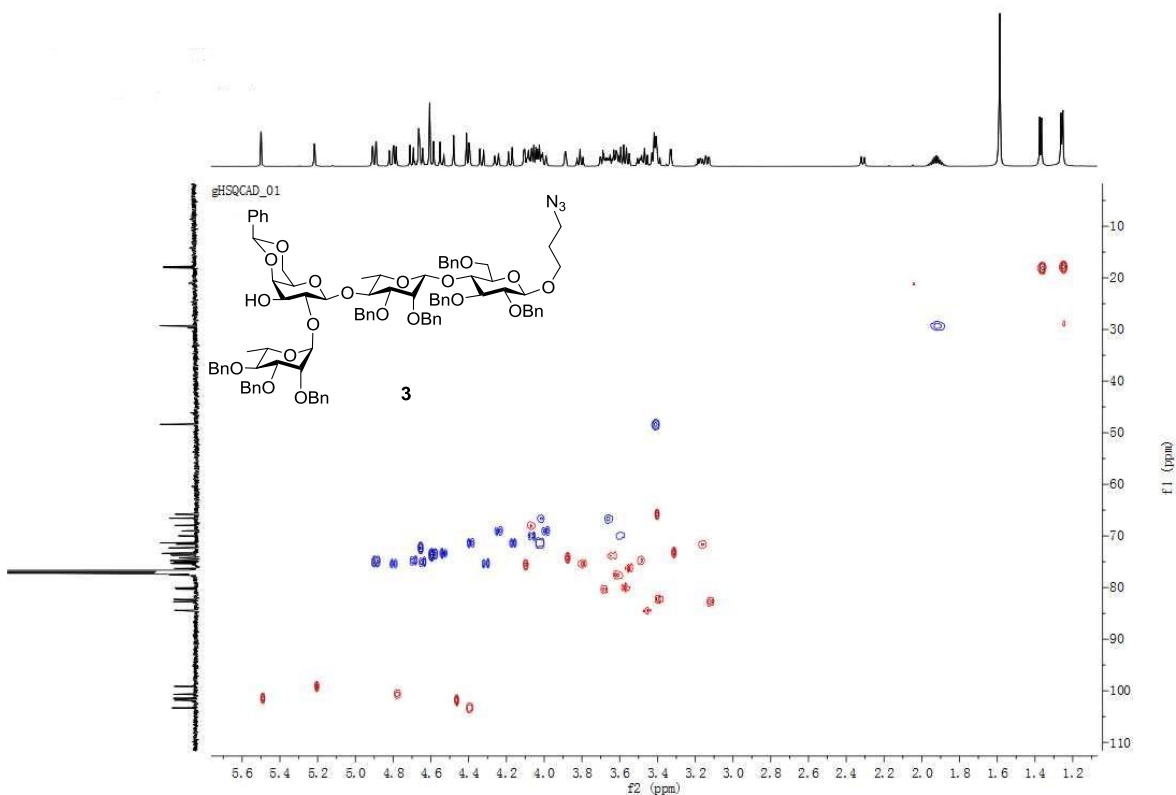


gHSQC NMR spectrum of compound **22** (600 MHz, CDCl₃, 25 °C)

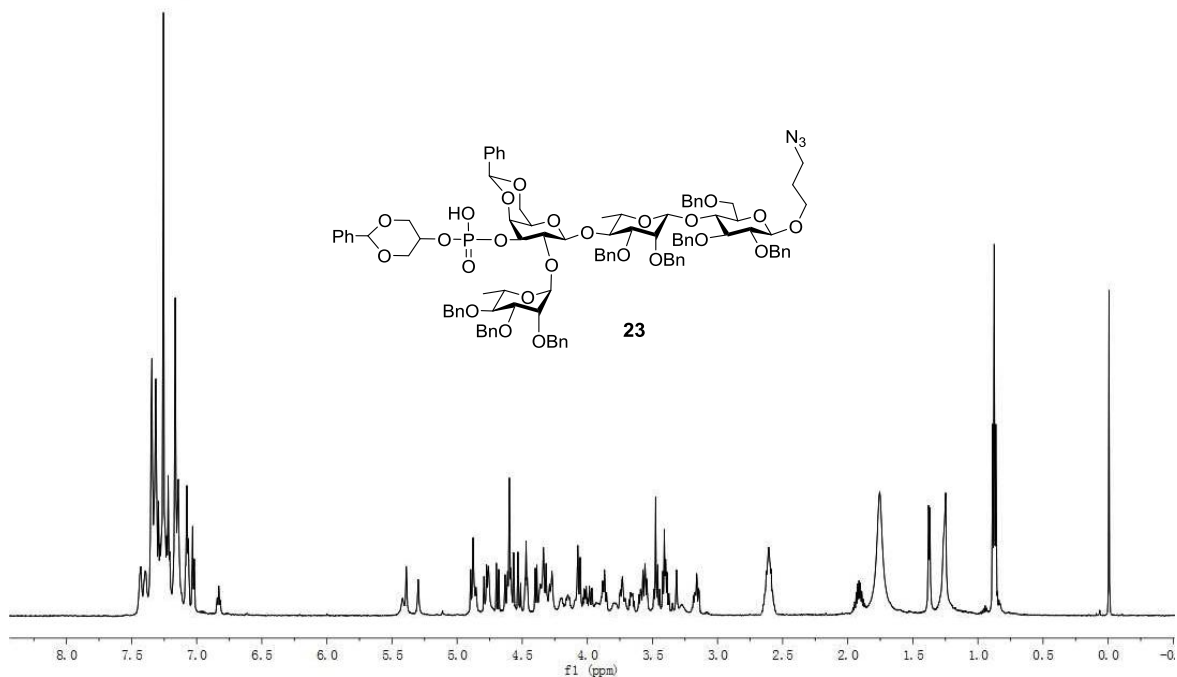




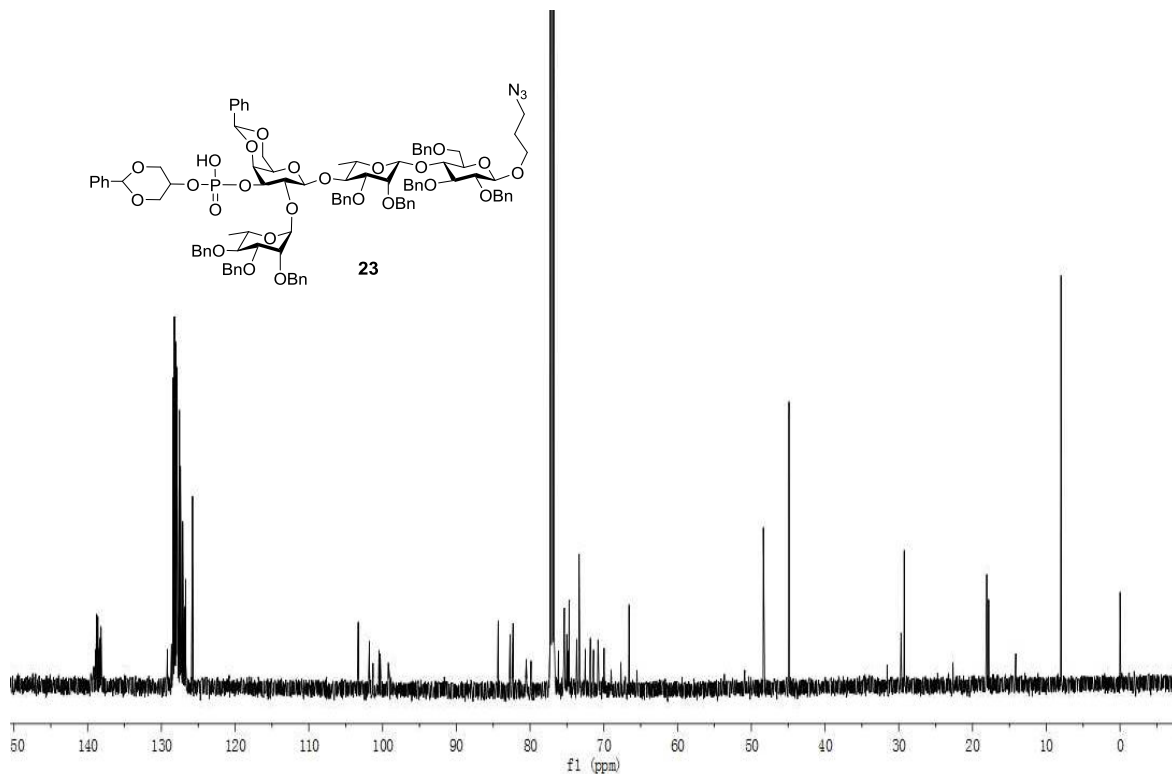
gCOSY NMR spectrum of compound **3** (600 MHz, CDCl₃, 25 °C)



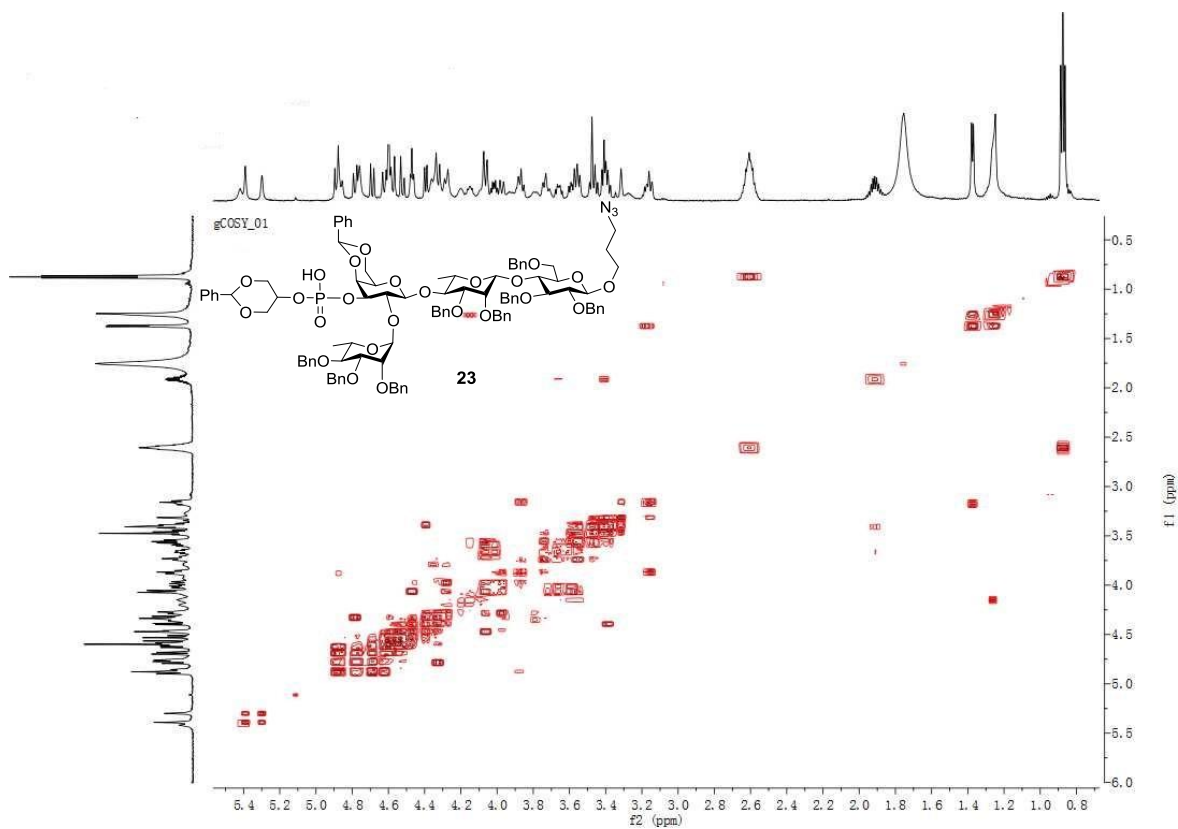
gHSQC NMR spectrum of compound **3** (600 MHz, CDCl₃, 25 °C)



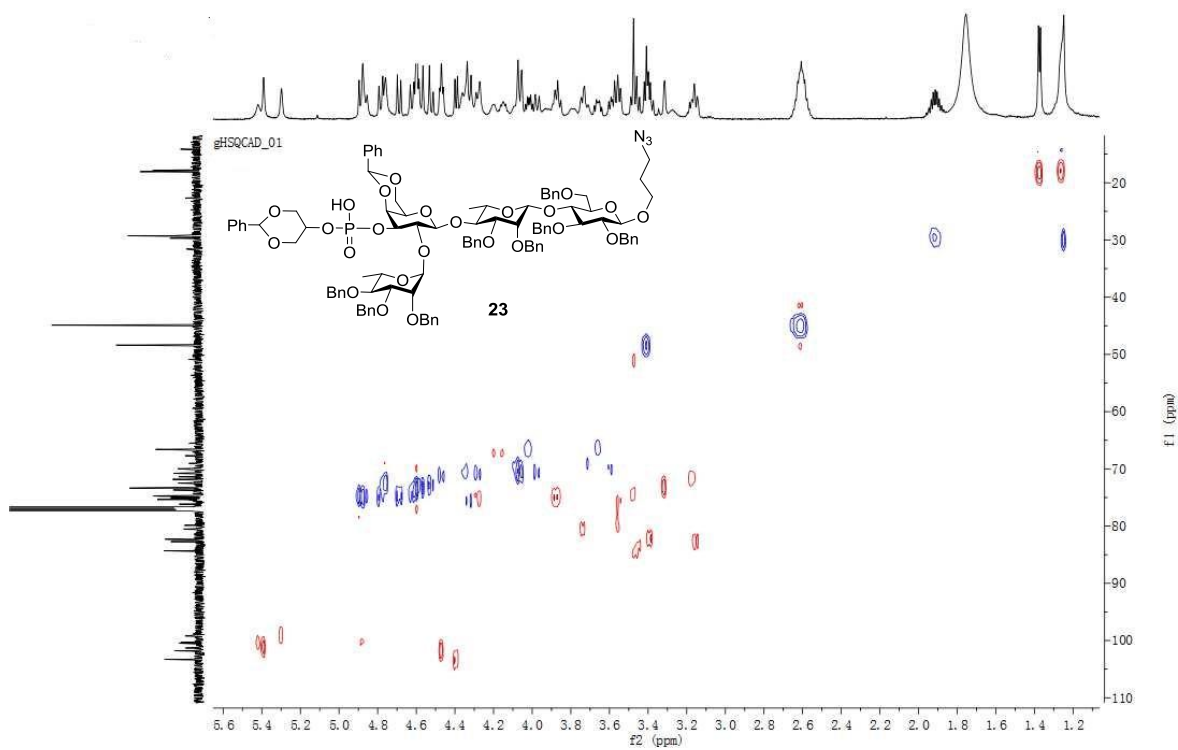
^1H NMR spectrum of compound **23** (600 MHz, CDCl_3 , 25 °C) as Et_3N salt



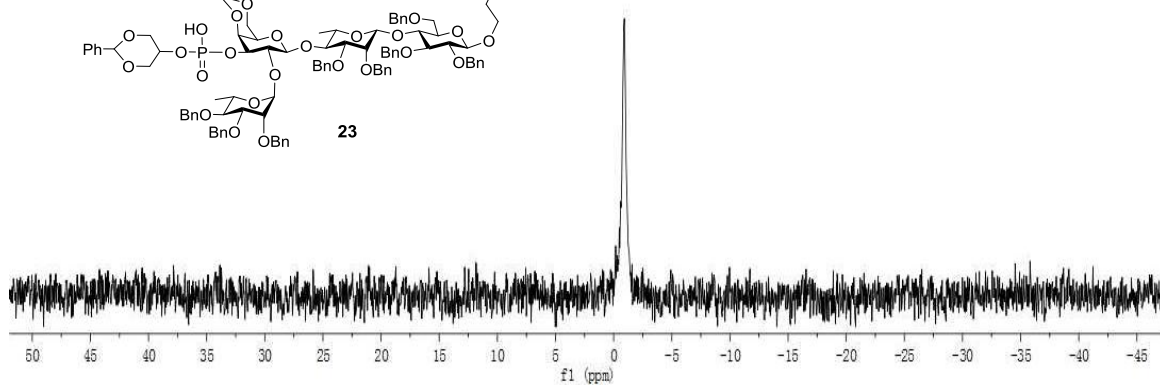
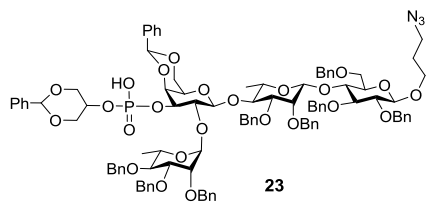
^{13}C NMR spectrum of compound **23** (150 MHz, CDCl_3 , 25 °C)



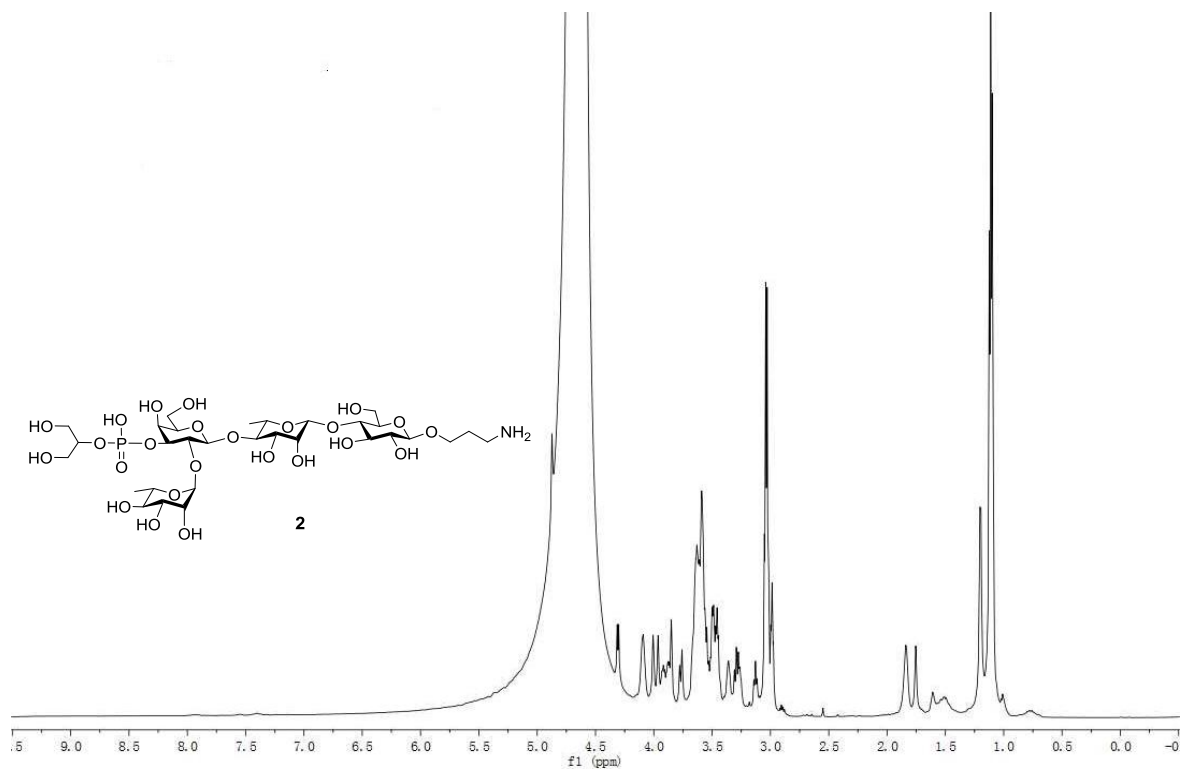
gCOSY NMR spectrum of compound **23** (600 MHz, CDCl₃, 25 °C)



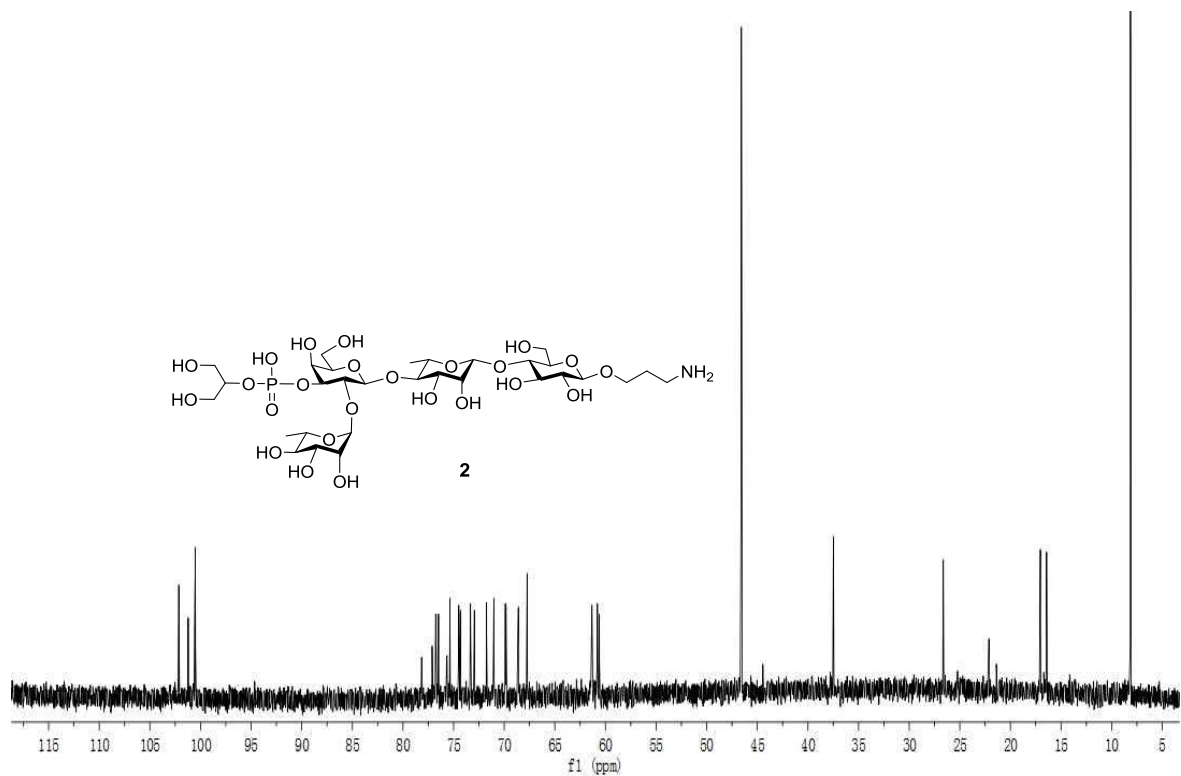
gHSQC NMR spectrum of compound **23** (600 MHz, CDCl₃, 25 °C)



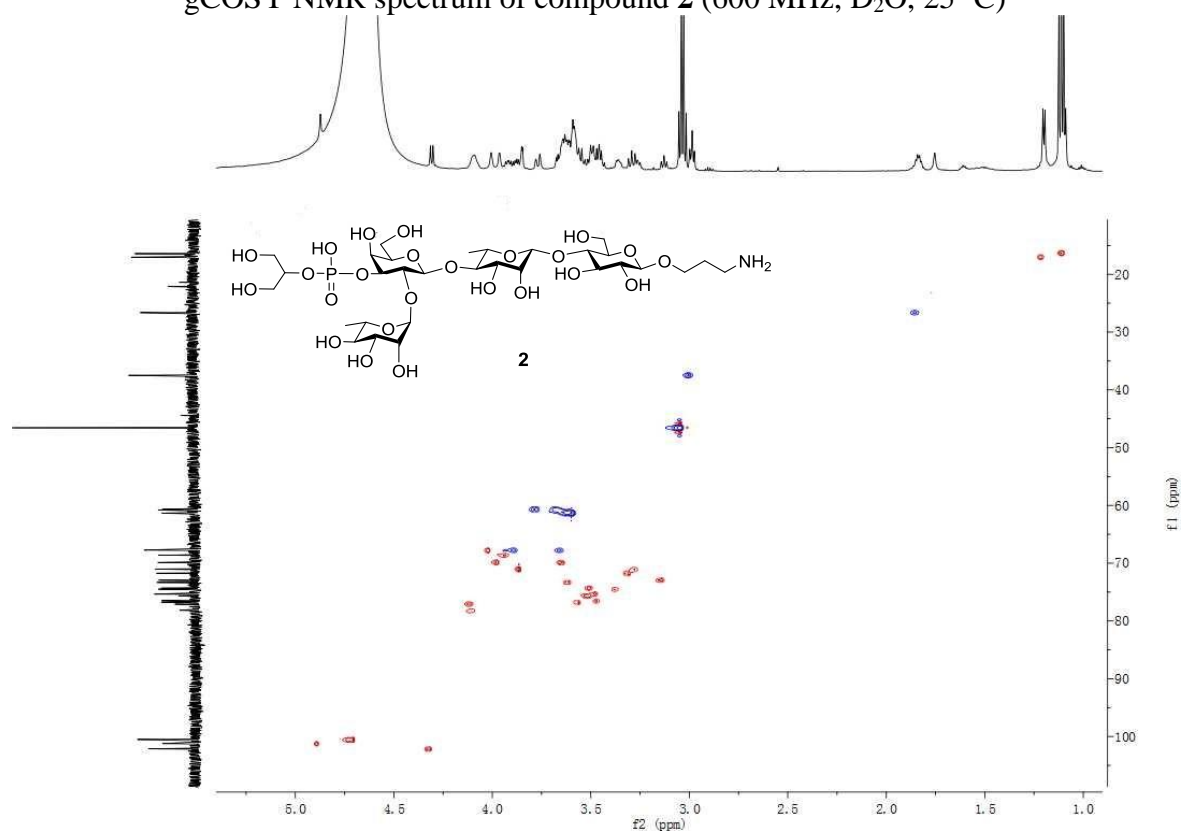
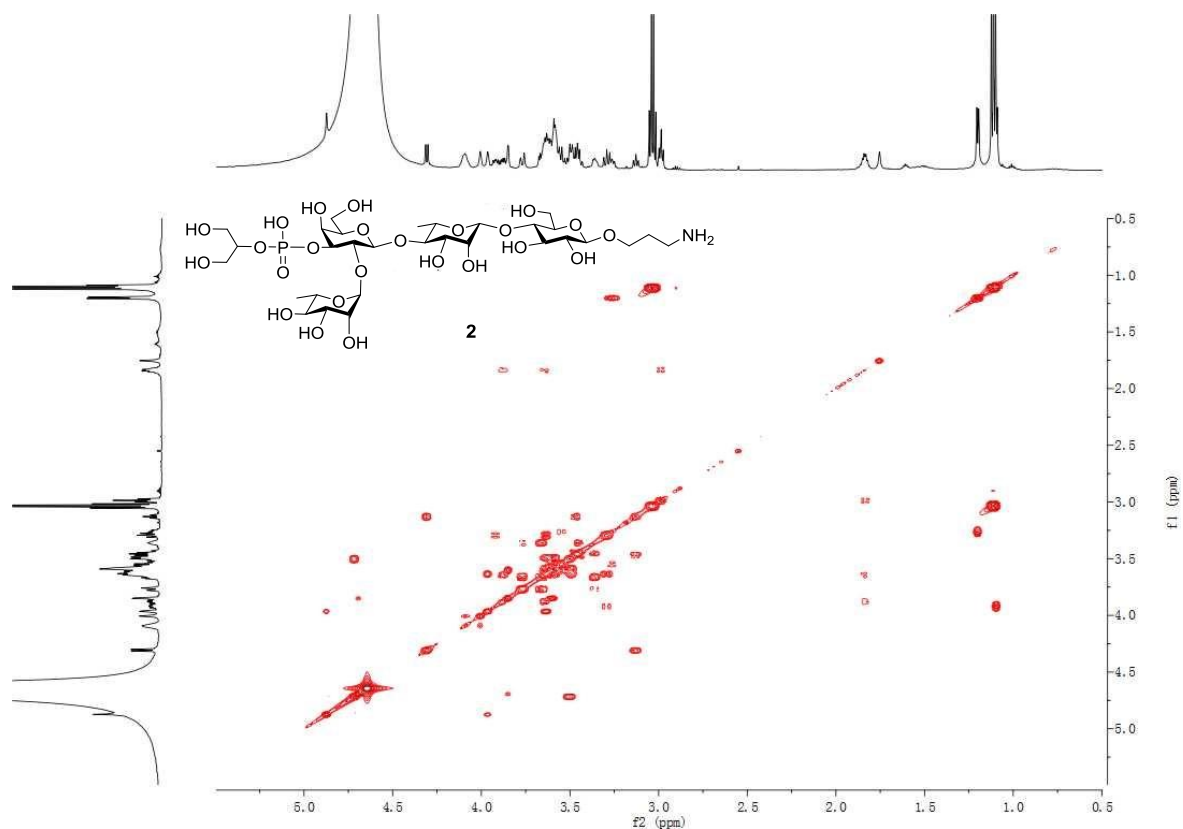
³¹P NMR spectrum of compound **23** (240 MHz, CDCl₃, 25 °C)

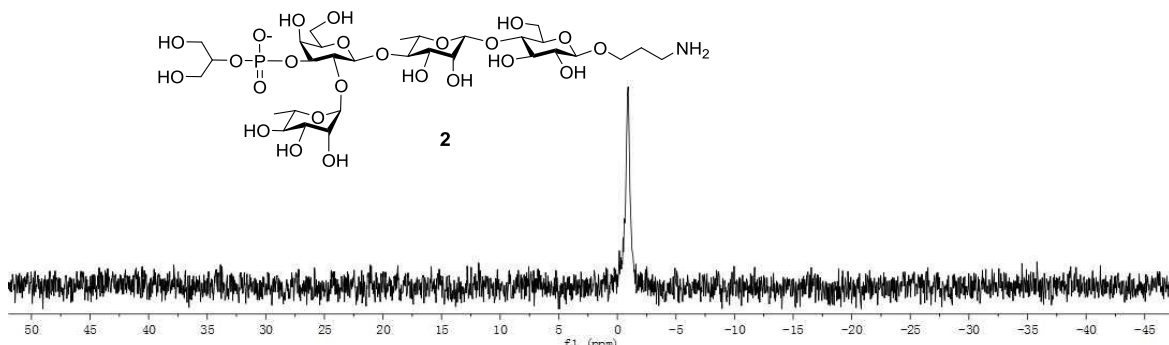


¹H NMR spectrum of compound **2** (600 MHz, D₂O, 25 °C) as Et₃N salt

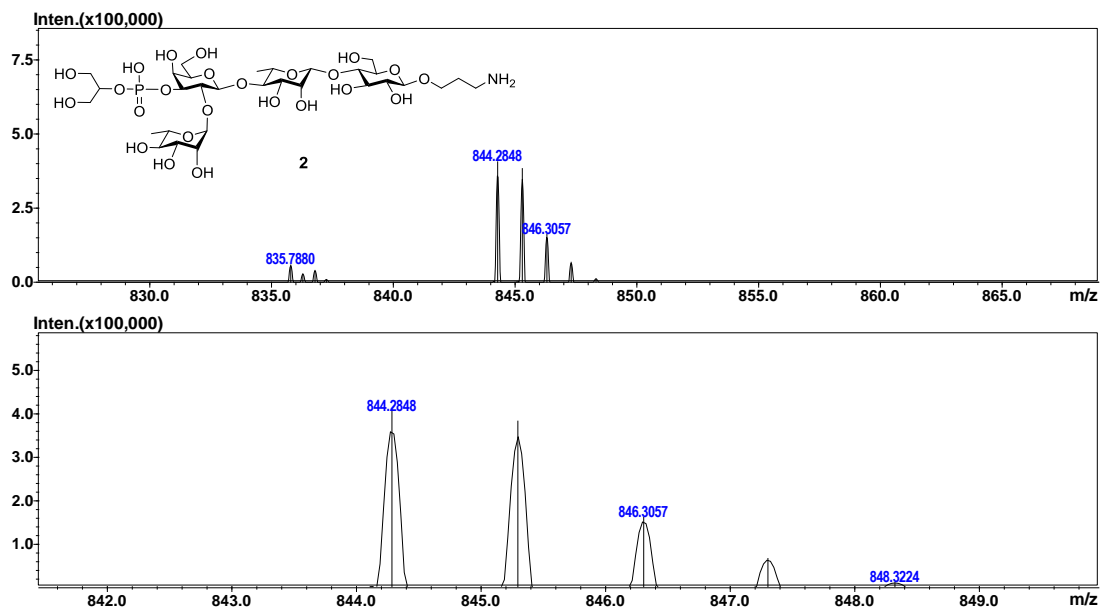


¹³C NMR spectrum of compound **2** (150 MHz, D₂O, 25 °C)





^{31}P NMR spectrum of compound 2 (243 MHz, D_2O , 25 °C)



ESI-TOF HRMS spectrum of compound 2