

Mitochondria-targeted betulinic and ursolic acids derivatives: synthesis and anticancer activity

Darya A. Nedopekina,^a Rinat R. Gubaidullin,^a Victor N. Odinov,^a Polina V. Maximchik,^b Boris Zhivotovsky,^{b,c} Yuriy P. Bel'skii,^d Veniamin A. Khazanov,^d Arina V. Manuylova,^d Vladimir Gogvadze,^{*b,c} and Anna Yu. Spivak^{*a}

^aInstitute of Petrochemistry and Catalysis, Russian Academy of Sciences, 141 prosp. Oktyabrya, Ufa 450075, Russian Federation.

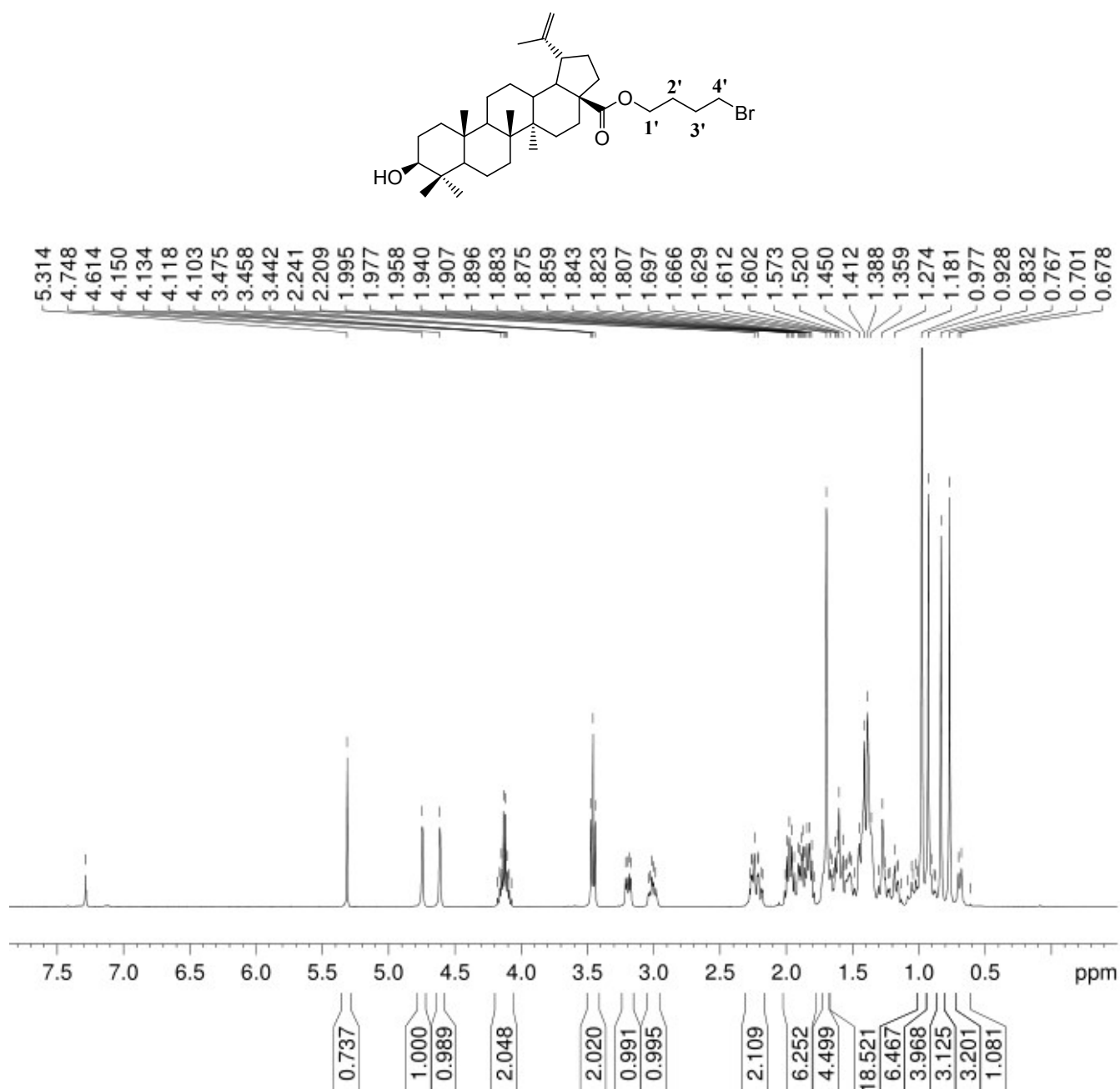
Email: spivak.ink@gmail.com

^bFaculty of Fundamental Medicine, MV Lomonosov Moscow State University, 11999 Moscow, Russia. Email: vlad_gogvadze@rambler.ru

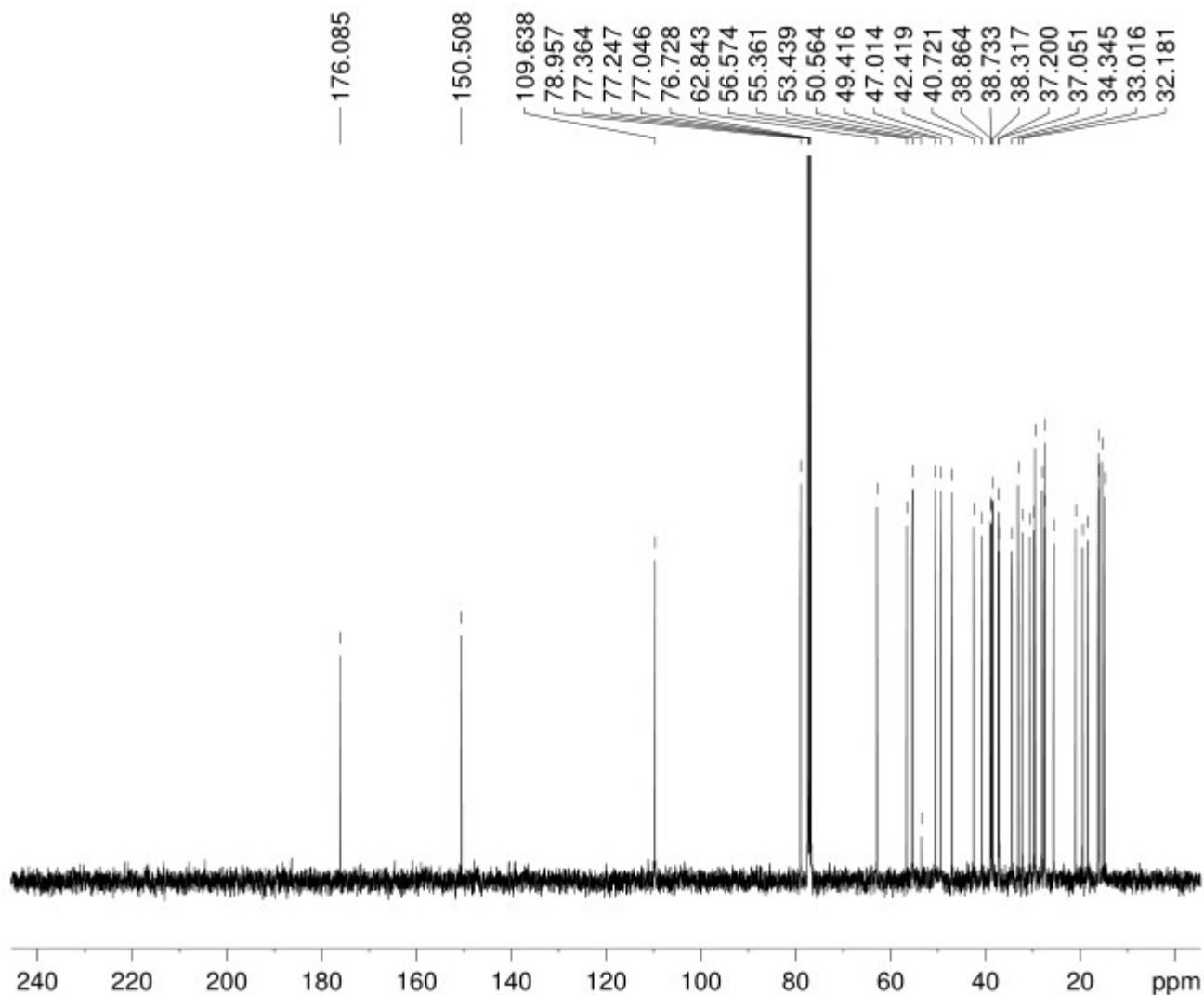
^cDivision of Toxicology, Institute of Environmental Medicine, Karolinska Institutet, Box 210, 17177 Stockholm, Sweden

^dInnovative Pharmacology Research (IPHAR), 79/4 Elizarova, Tomsk 634021, Russian Federation

4-Bromobutyl-3 β -hydroxylup-20(29)-en-28-oate **1**
¹H NMR spectra (CDCl₃)

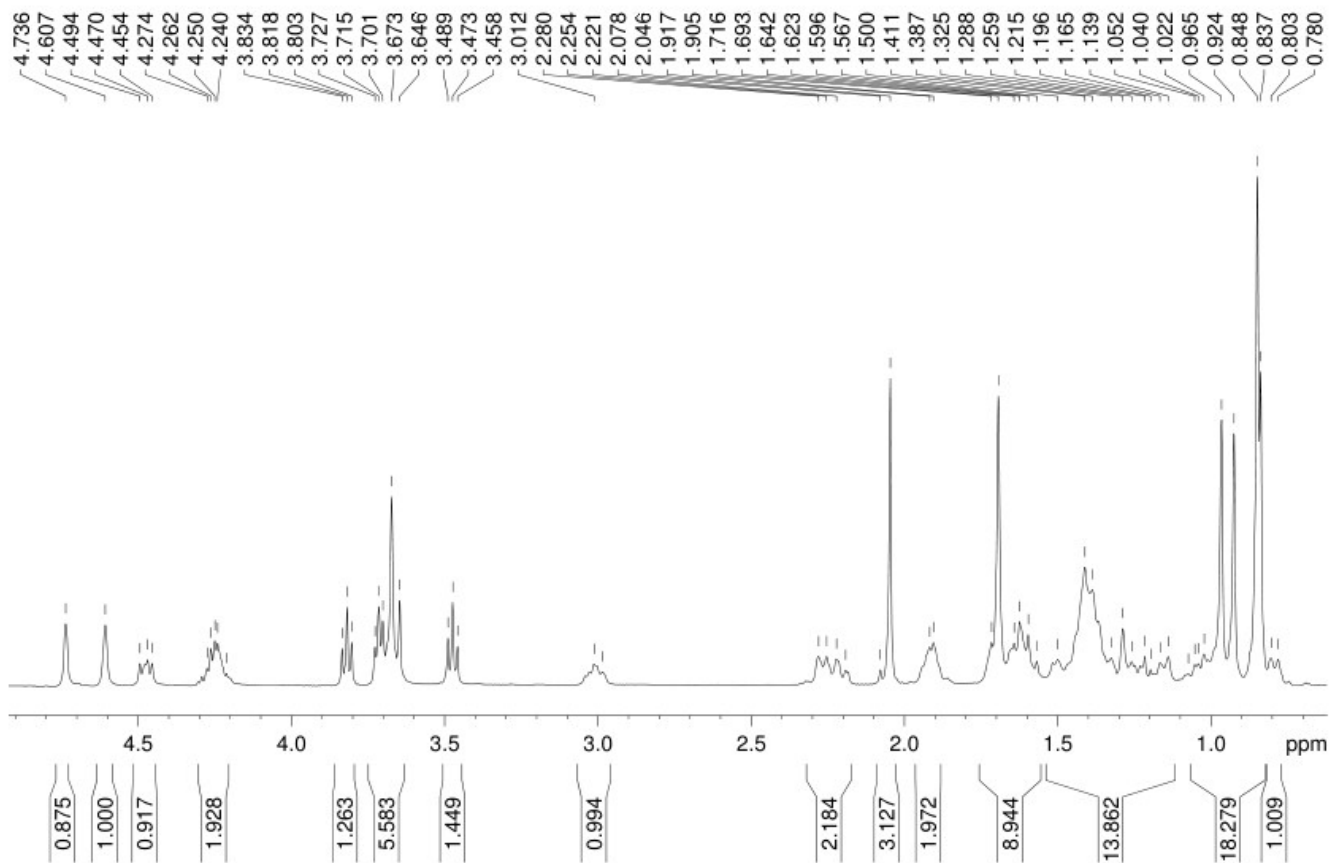
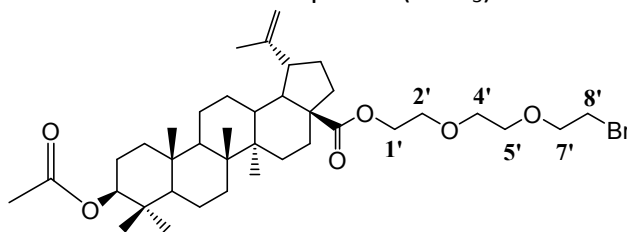


4-Bromobutyl-3 β -hydroxylup-20(29)-en-28-oate **1**
¹³C NMR spectra (CDCl₃)

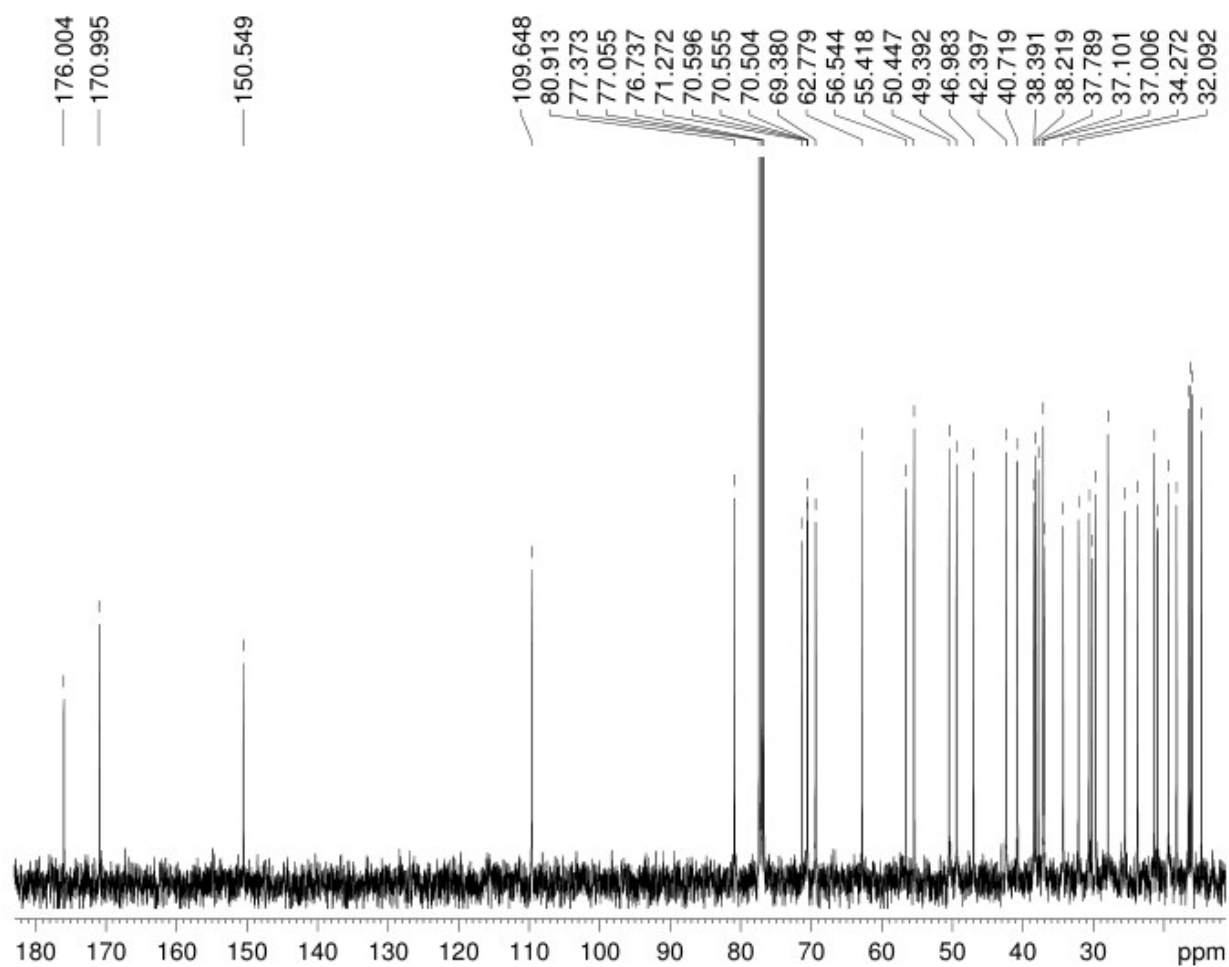


8'-Bromo-3',6'-dioxaoctan-1'-yl-3 β -acetoxylup-20(29)-en-28-oate **2**

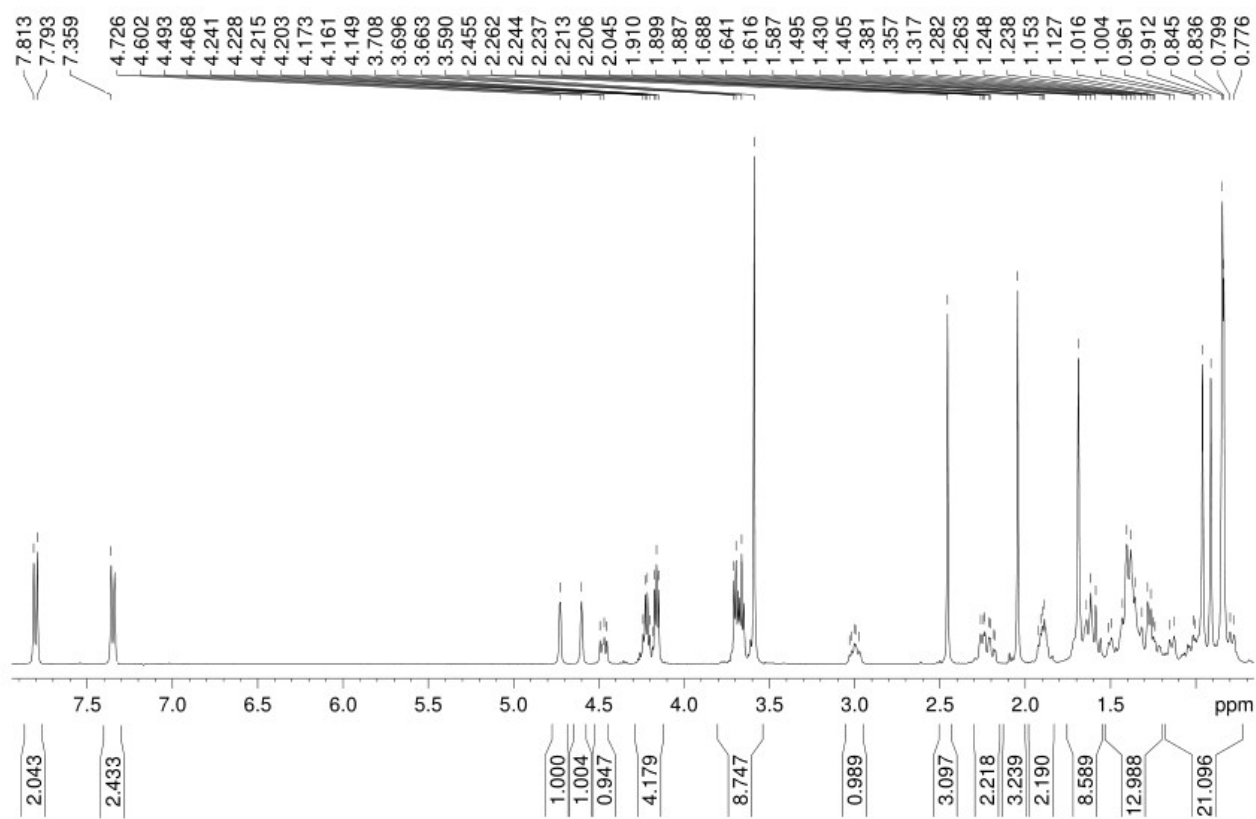
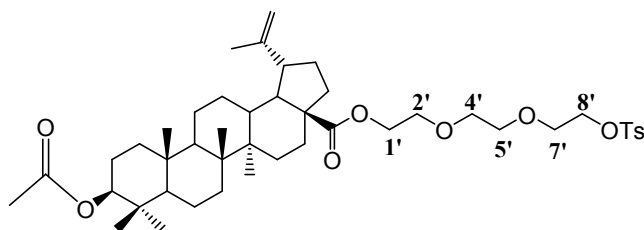
¹H NMR spectra (CDCl₃)



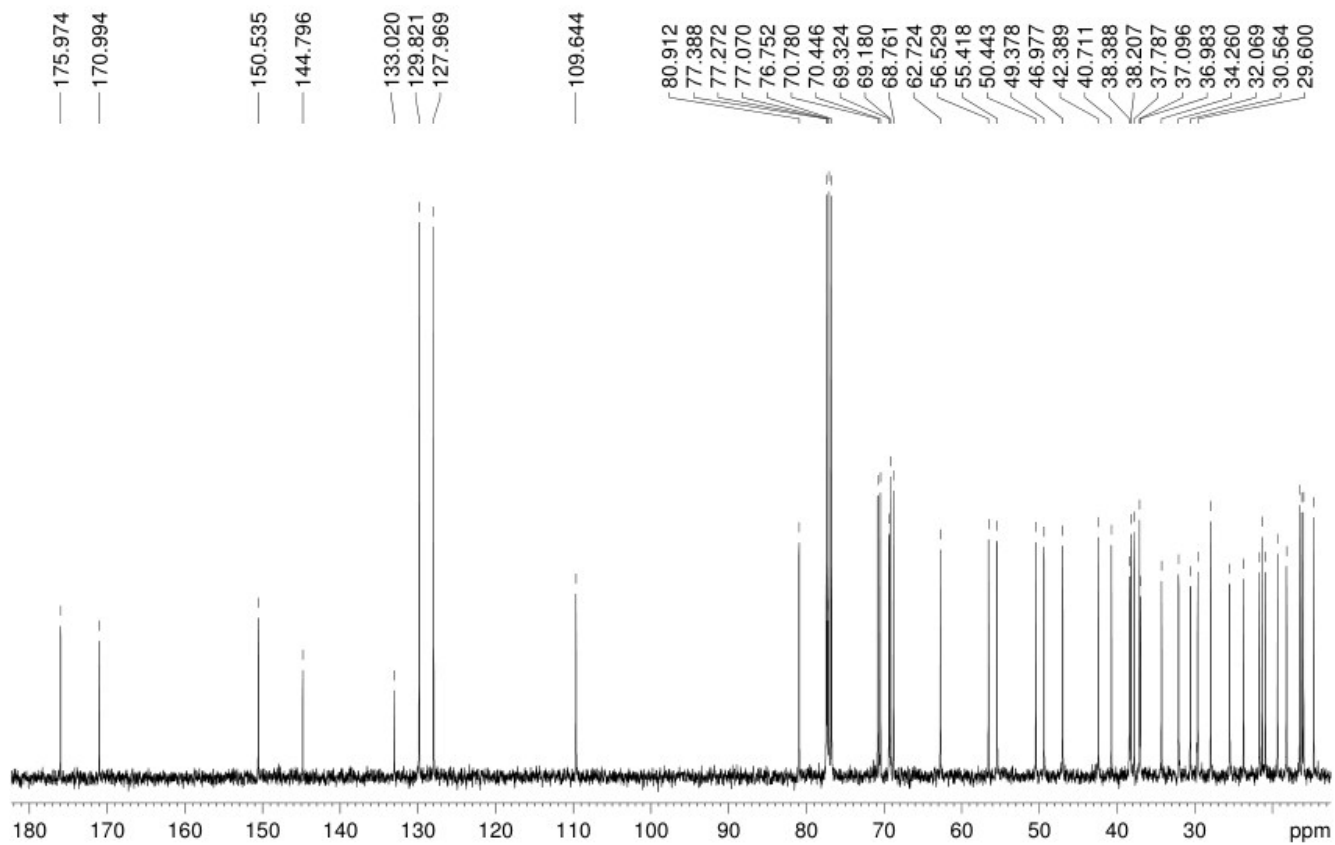
8'-Bromo-3',6'-dioxaoctan-1'-yl-3 β -acetoxylup-20(29)-en-28-oate **2**
 ^{13}C NMR spectra (CDCl_3)



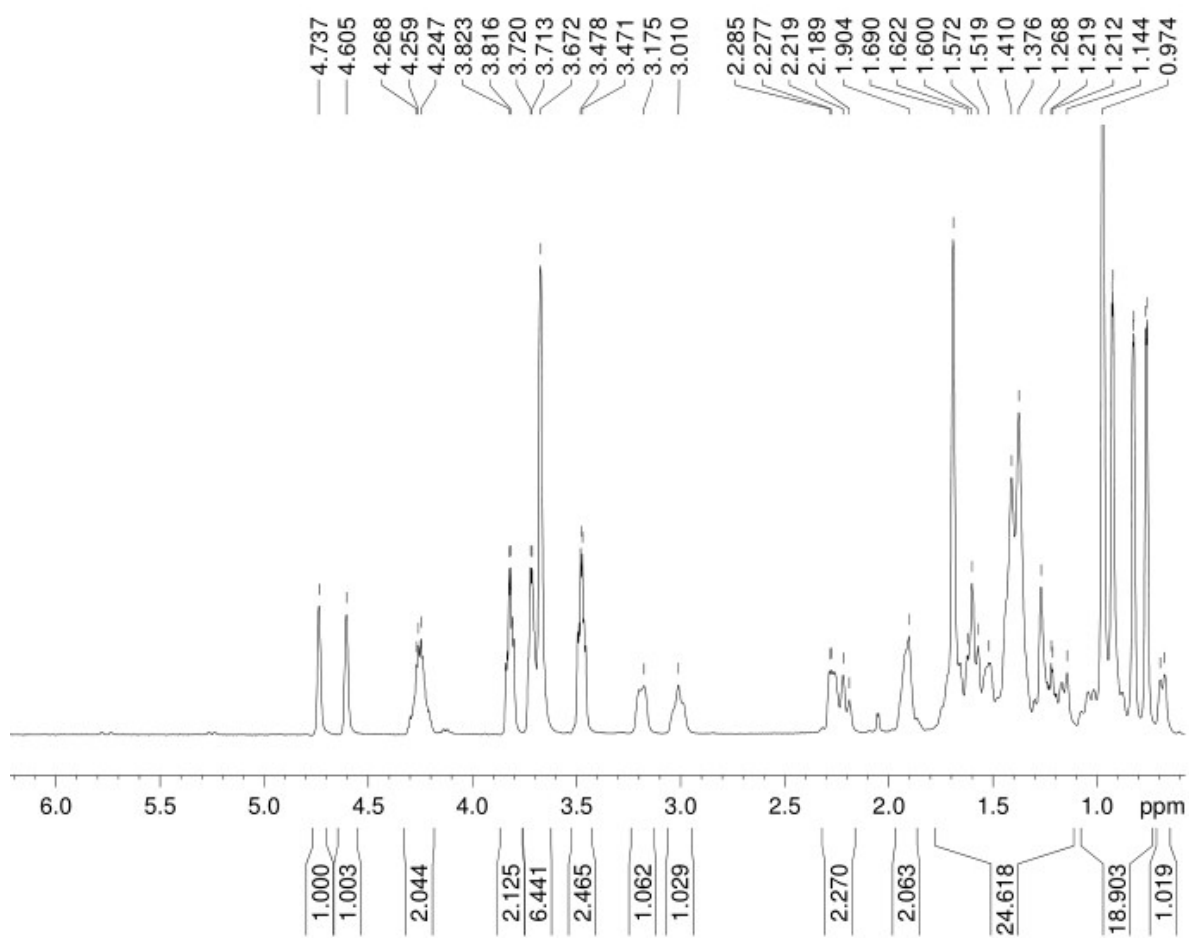
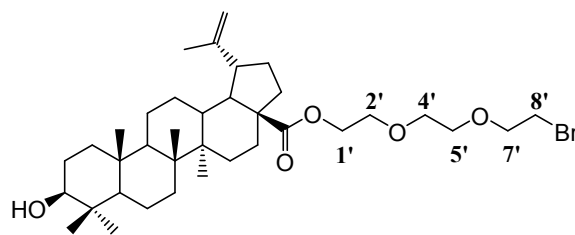
8'-Tosyl-3',6'-dioxaoctan-1'-yl- β -acetoxylup-20(29)-en-28-oate **3**
 ^1H NMR spectra (CDCl_3)



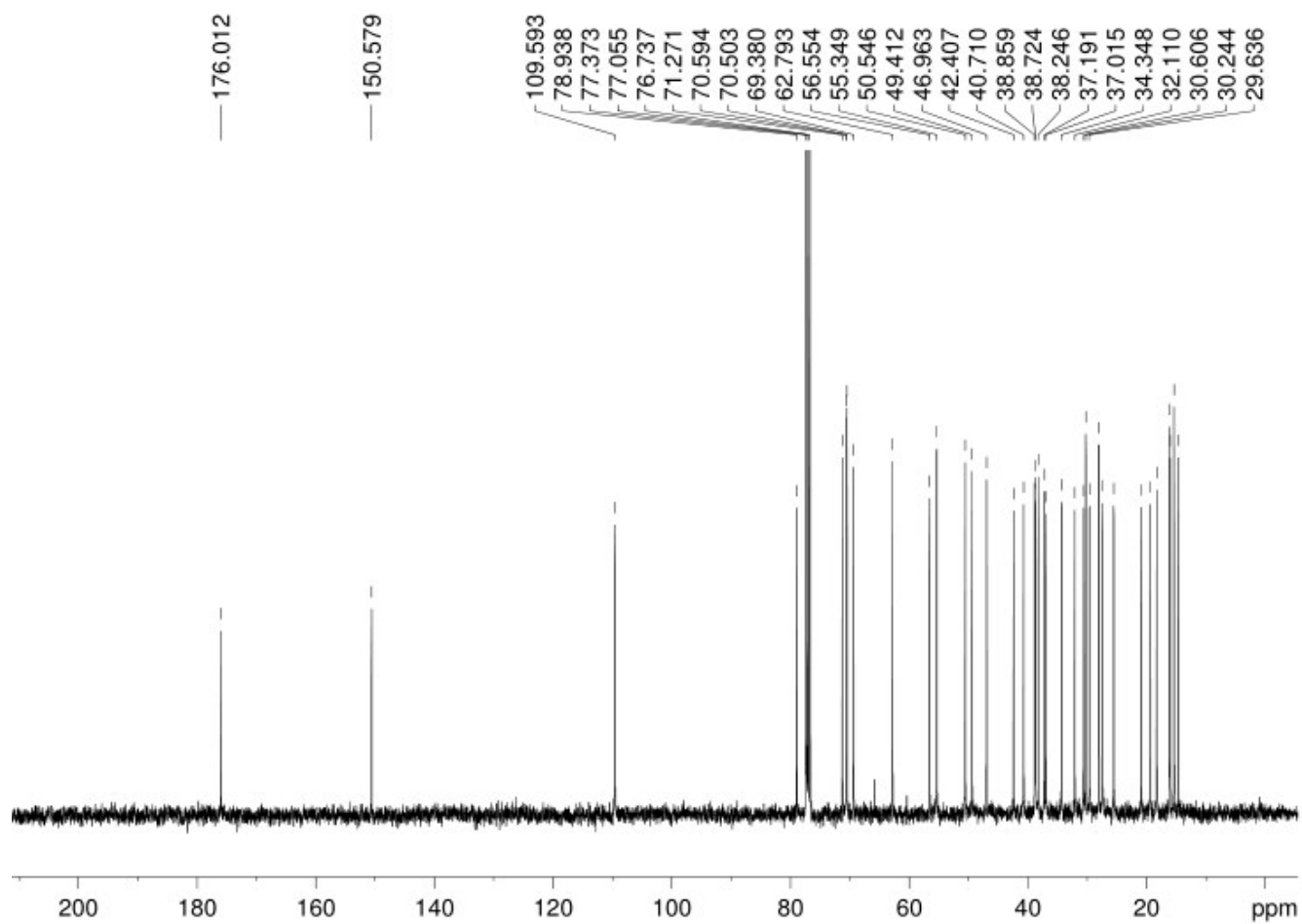
8'-Tosyl-3',6'-dioxaoctan-1'-yl-3 β -acetoxylup-20(29)-en-28-oate **3**
 ^{13}C NMR spectra (CDCl_3)



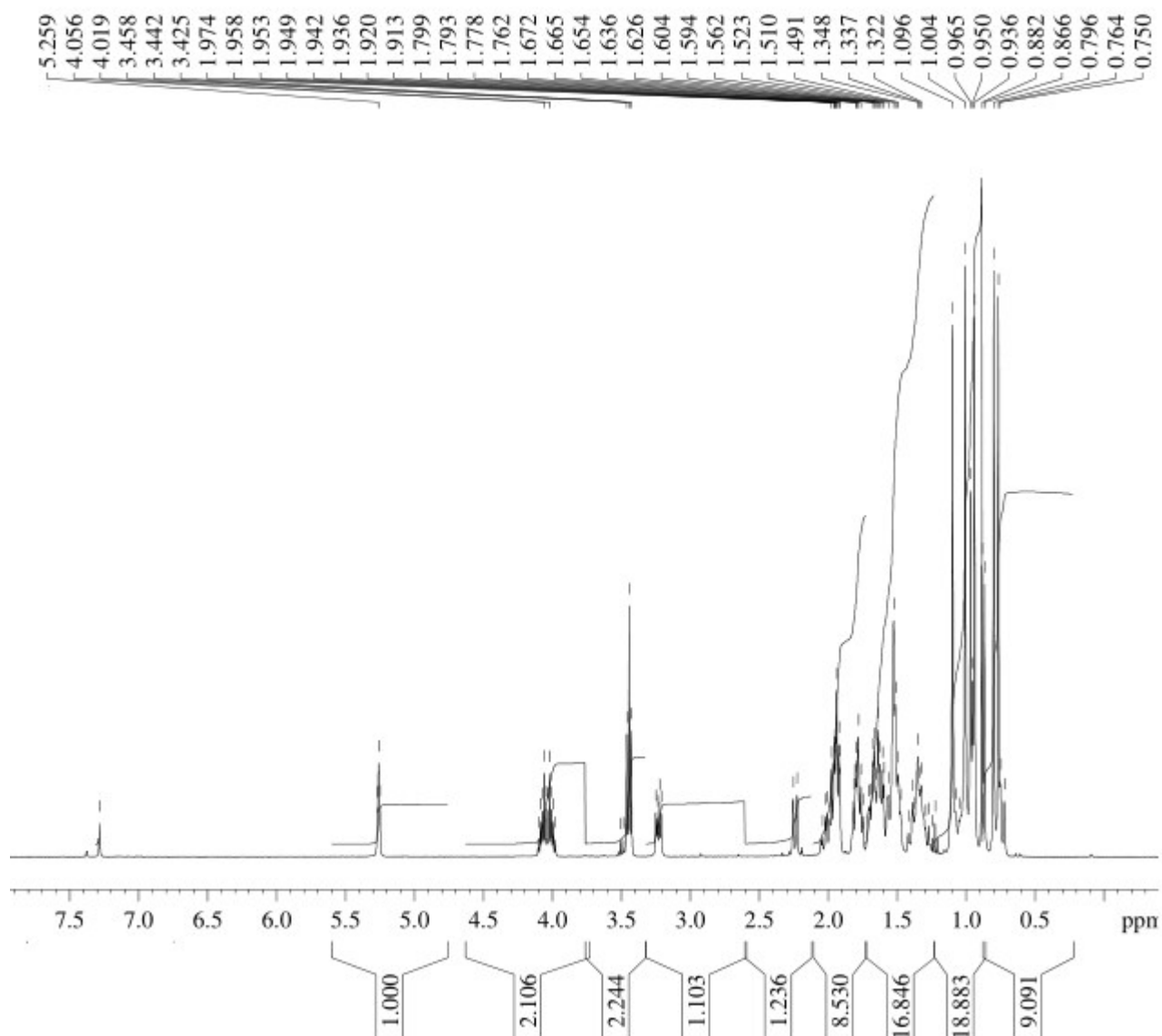
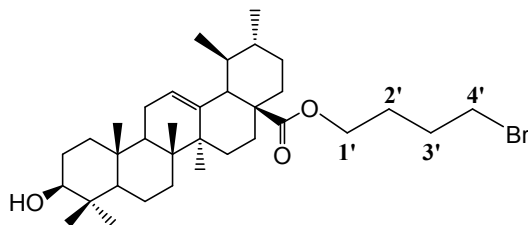
8'-Bromo-3',6'-dioxaoctan-1'-yl-3 β -hydroxylup-20(29)-en-28-oate **4**
 ^1H NMR spectra (CDCl_3)



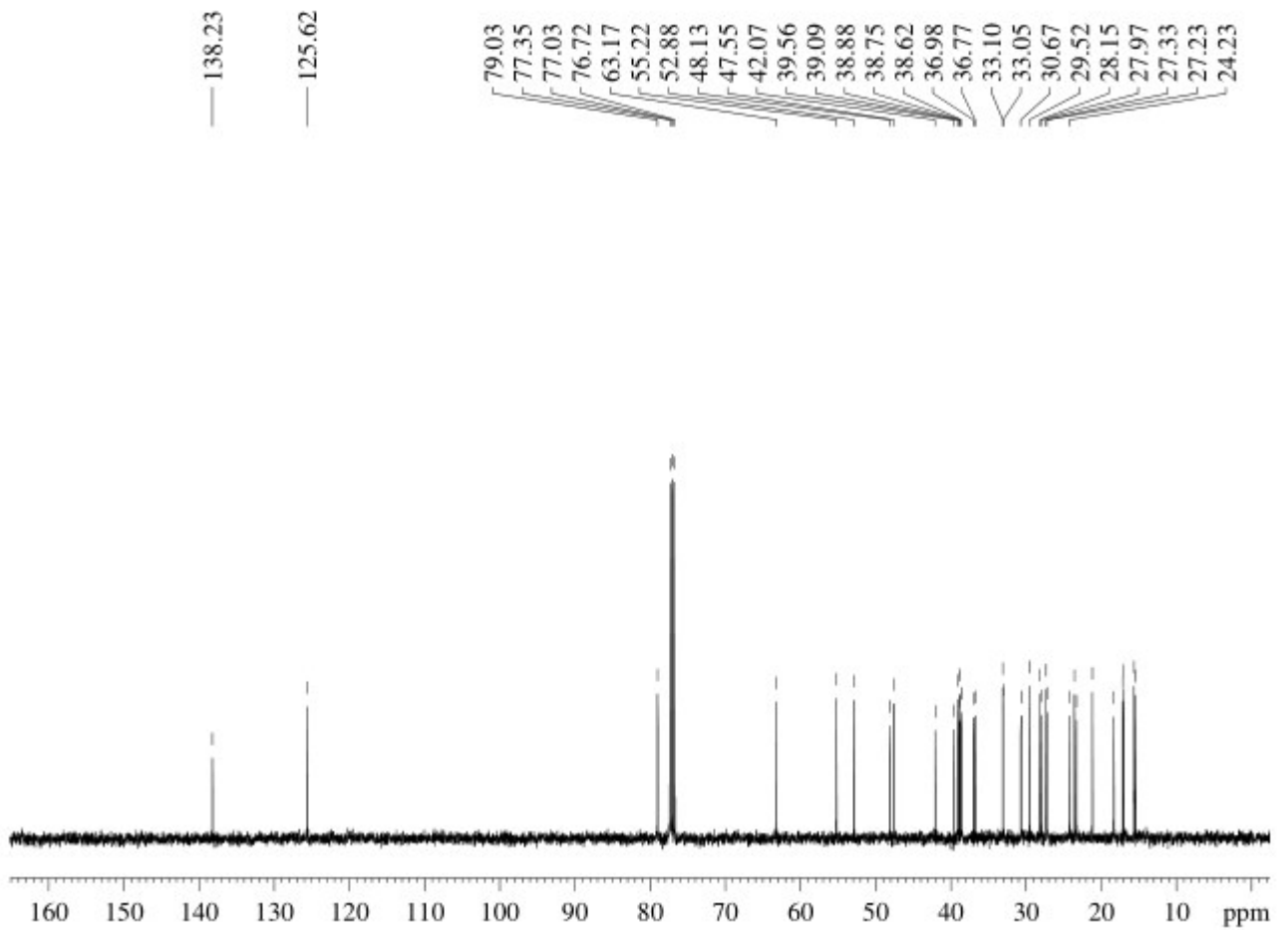
8'-Bromo-3',6'-dioxaoctan-1'-yl-3 β -hydroxylup-20(29)-en-28-oate **4**
 ^{13}C NMR spectra (CDCl_3)



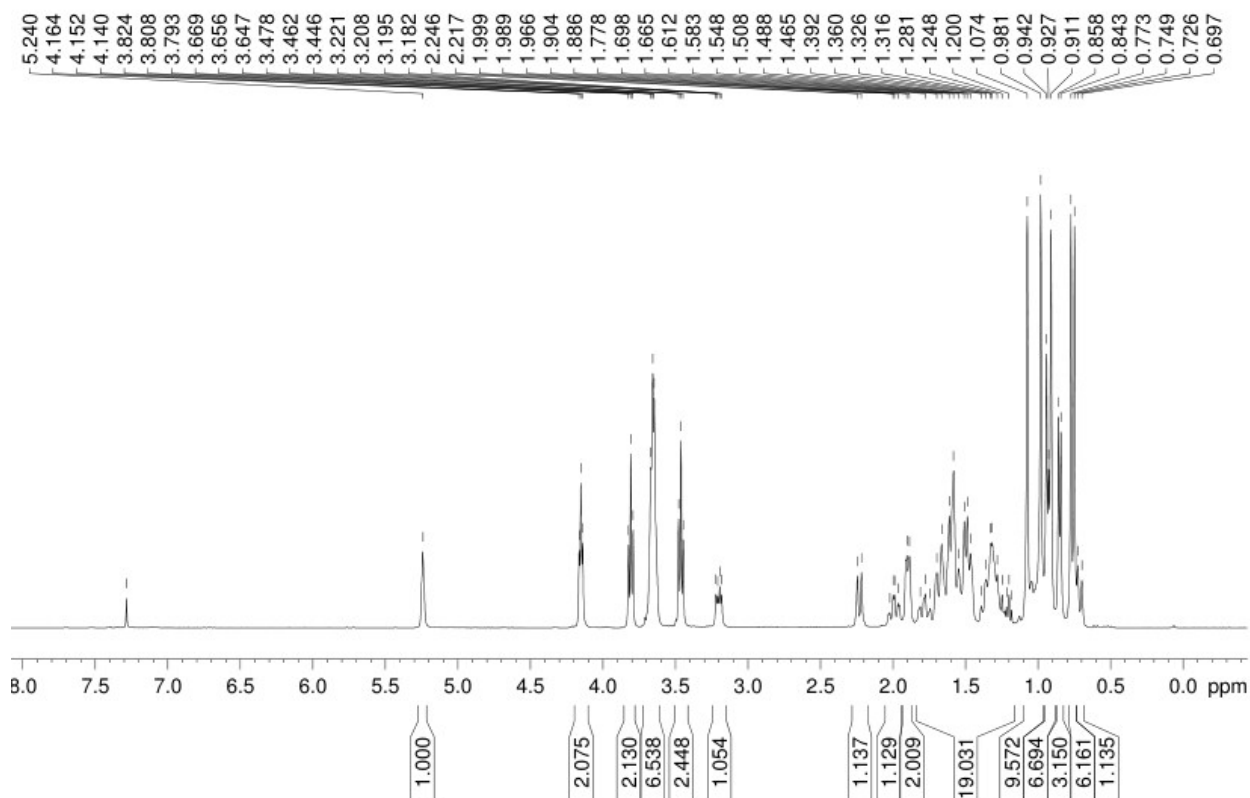
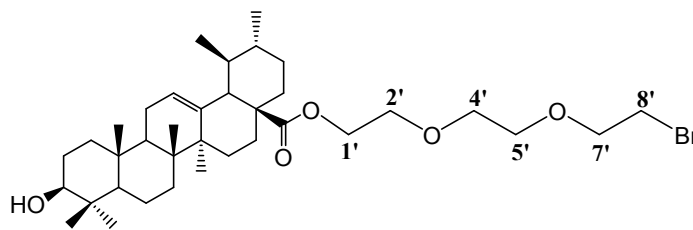
4-Bromobutyl-3 β -hydroxyurs-12en-28-oate **11**
 ^1H NMR spectra (CDCl_3)



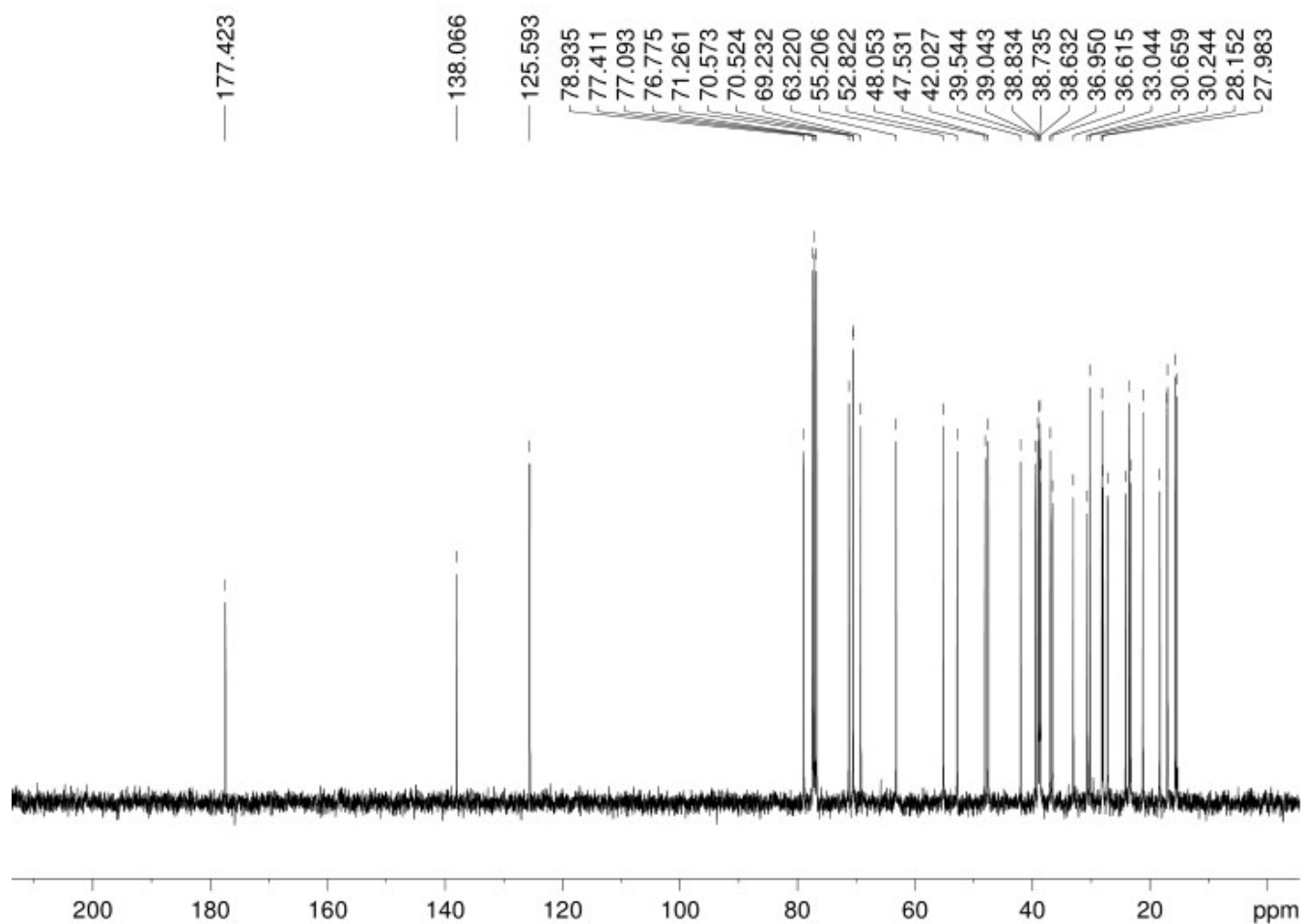
4-Bromobutyl-3 β -hydroxyurs-12en-28-oate **11**
 ^{13}C NMR spectra (CDCl_3)



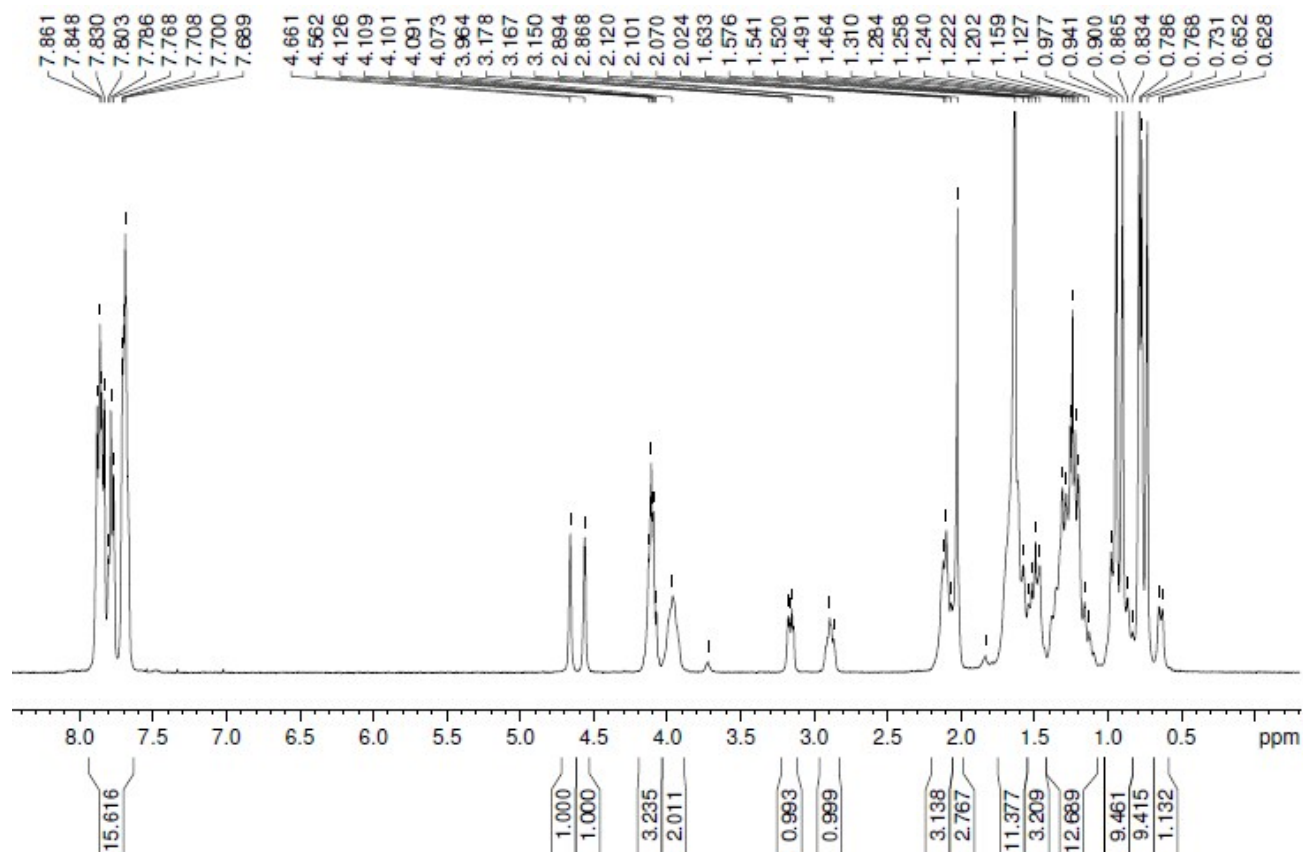
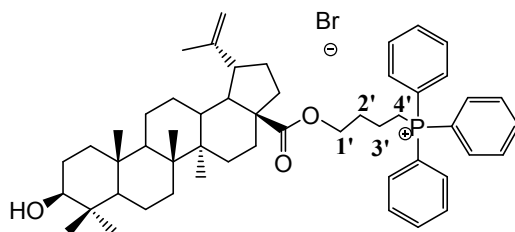
8'-Bromo-3',6'-dioxaoctan-1'-yl-3 β -hydroxyurs-12-en-28-oate **12**
 ^1H NMR spectra (CDCl_3)



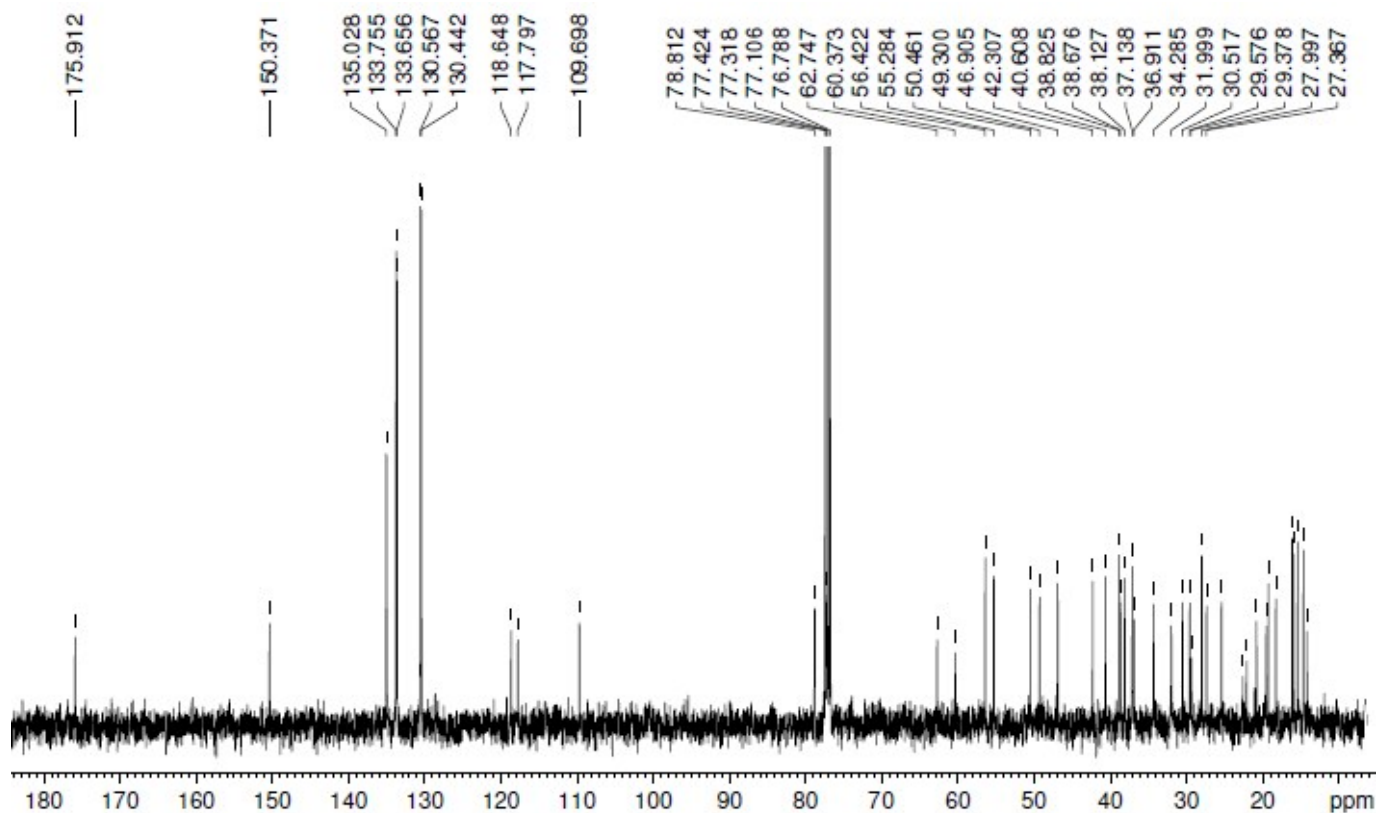
8'-Bromo-3',6'-dioxaoctan-1'-yl-3 β -hydroxyurs-12-en-28-oate **12**
¹³C NMR spectra (CDCl₃)



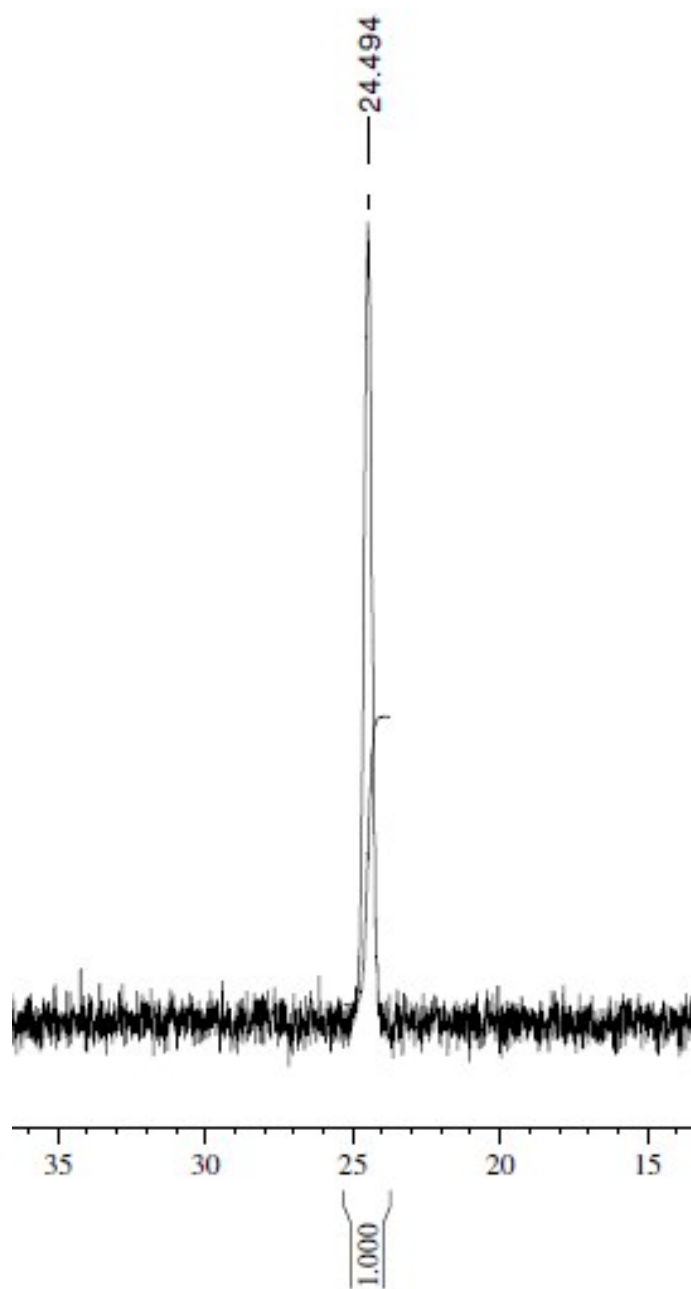
4-(triphenylphosphonio)butyl-3 β -hydroxylup-20(29)-en-28-oate bromide **5**
 ^1H NMR spectra (CDCl_3)



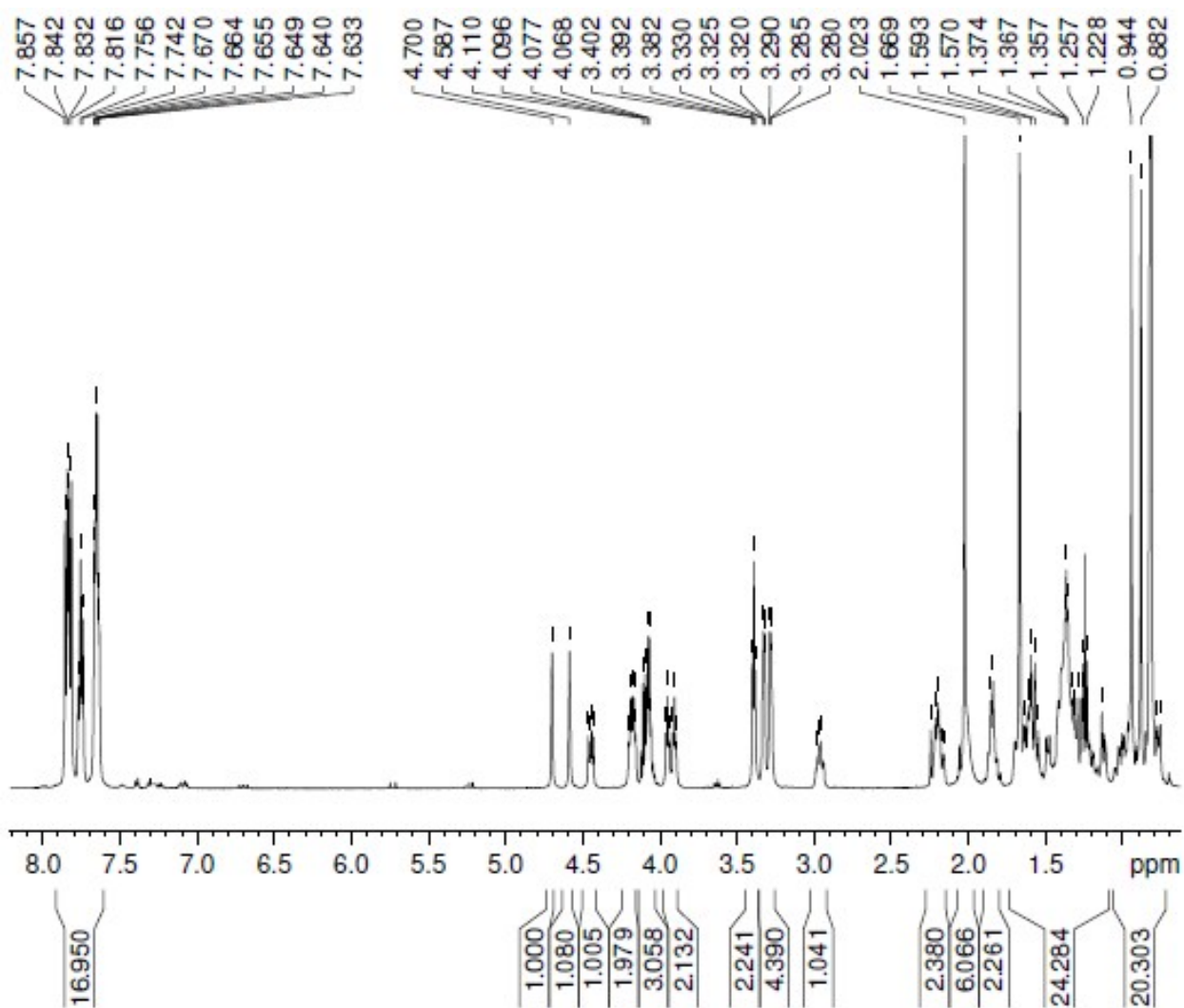
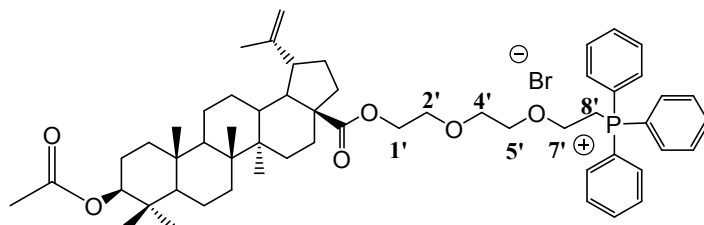
4-(triphenylphosphonio)butyl-3 β -hydroxylup-20(29)-en-28-oate bromide **5**
 ^{13}C NMR spectra (CDCl_3)



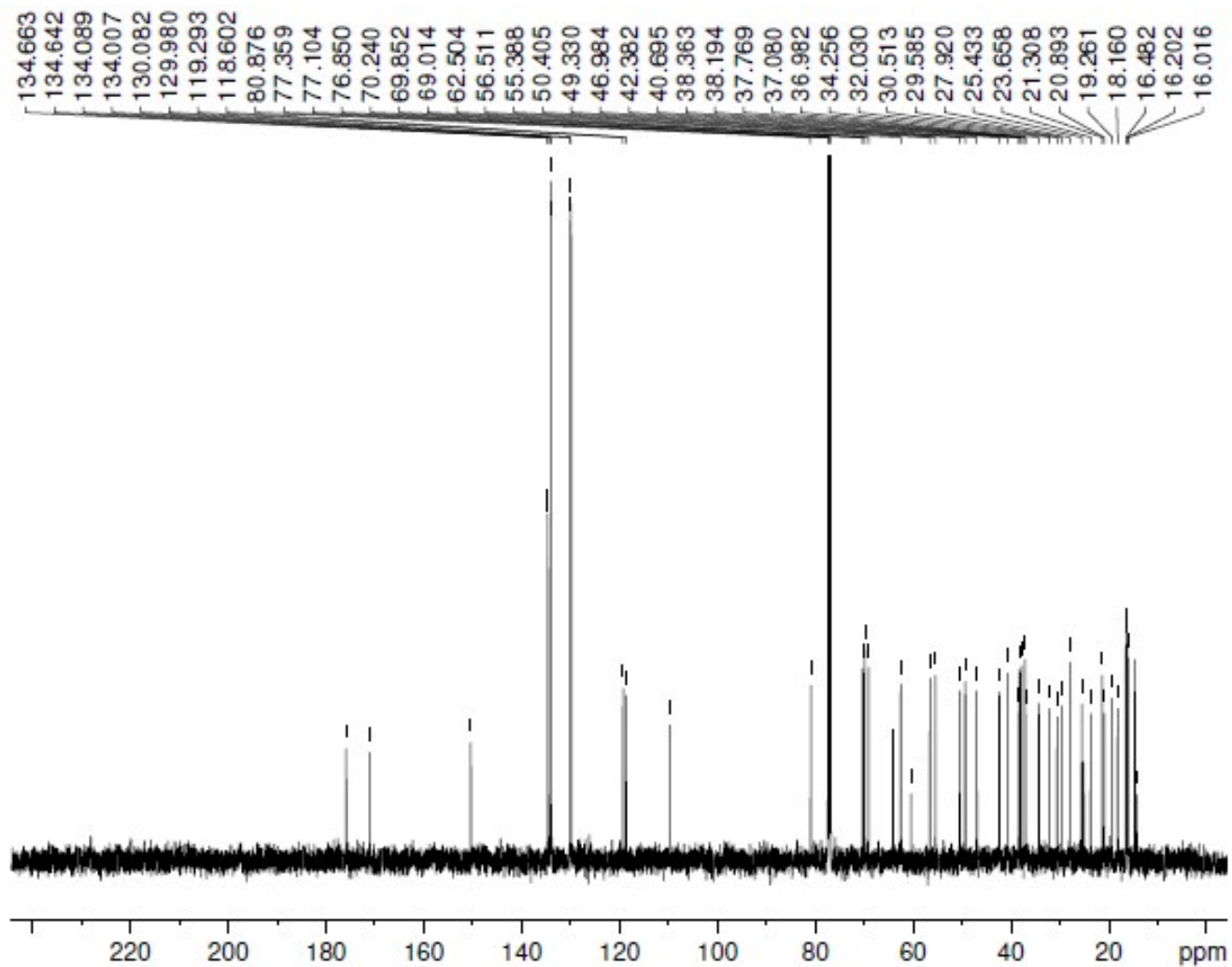
4-(triphenylphosphonio)butyl-3 β -hydroxylup-20(29)-en-28-oate bromide **5**
 ^{31}P NMR spectra (CDCl_3)



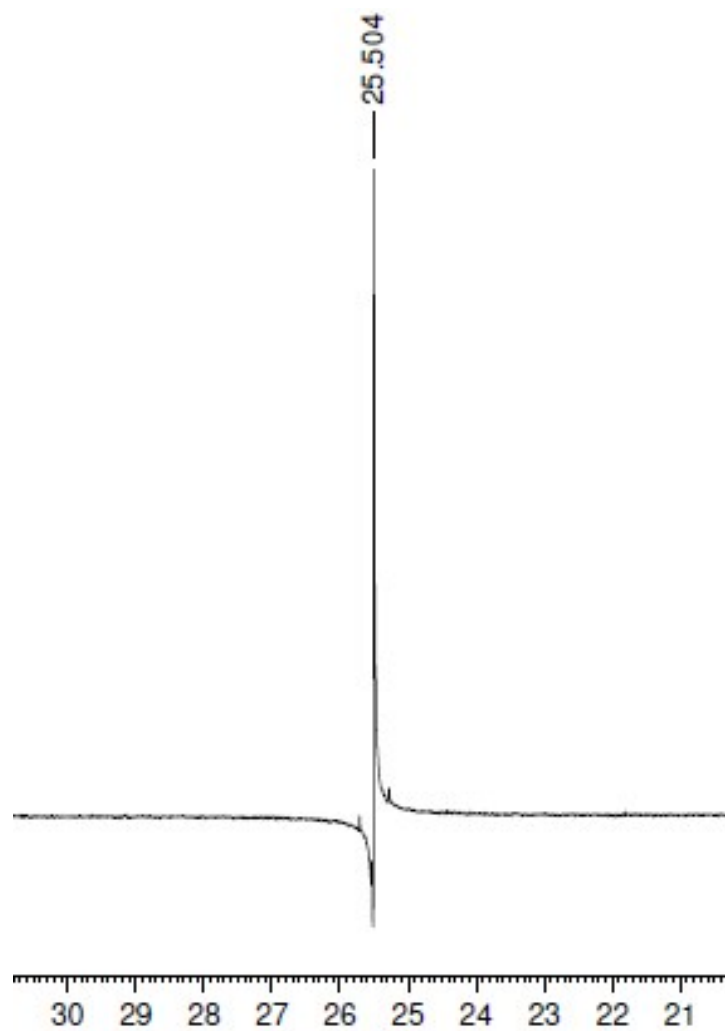
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -acetoxyilup-20(29)-en-28-oate bromide **7**
 ^1H NMR spectra (CDCl_3)



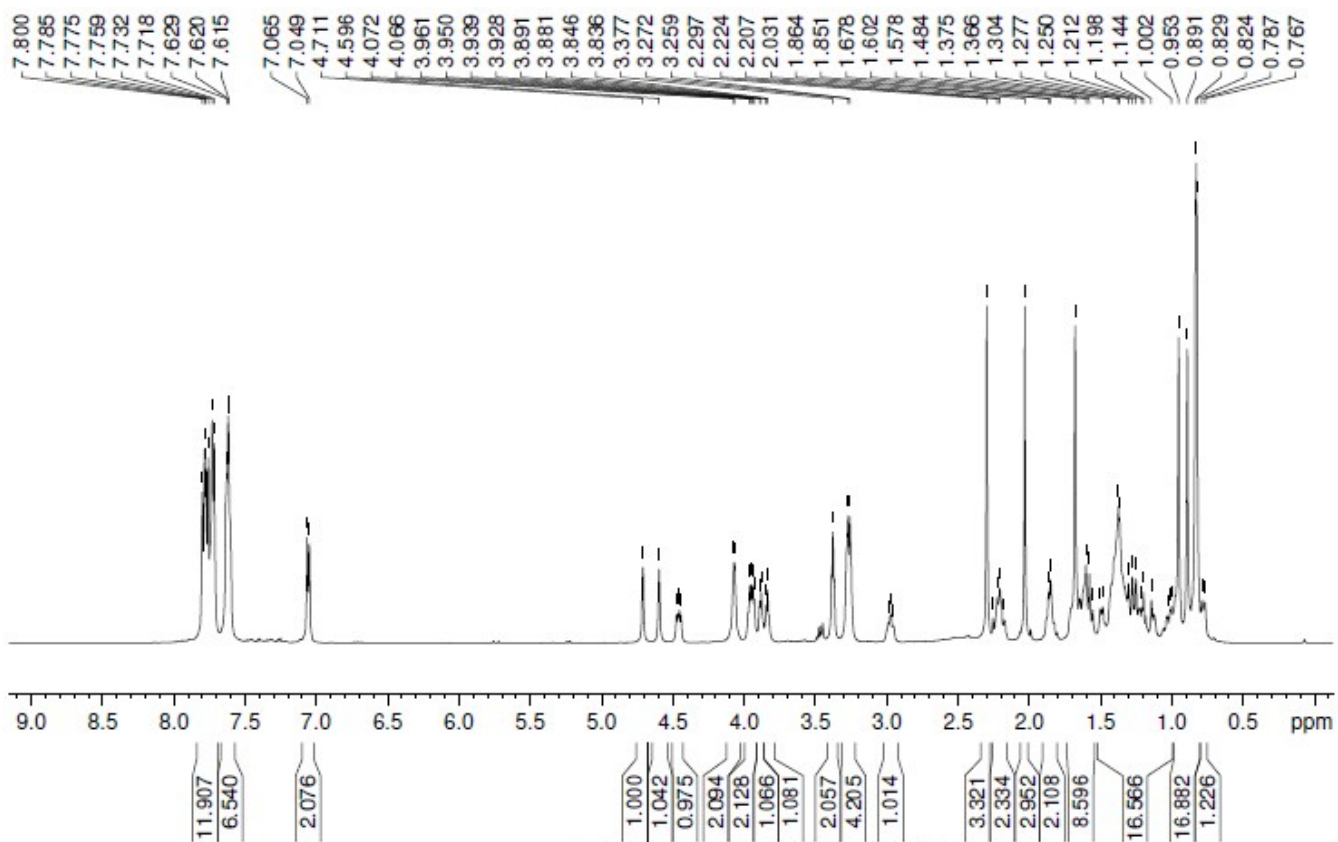
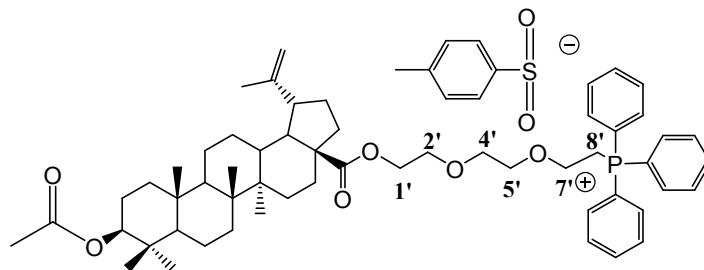
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -acetylup-20(29)-en-28-oate bromide **7**
 ^{13}C NMR spectra (CDCl_3)



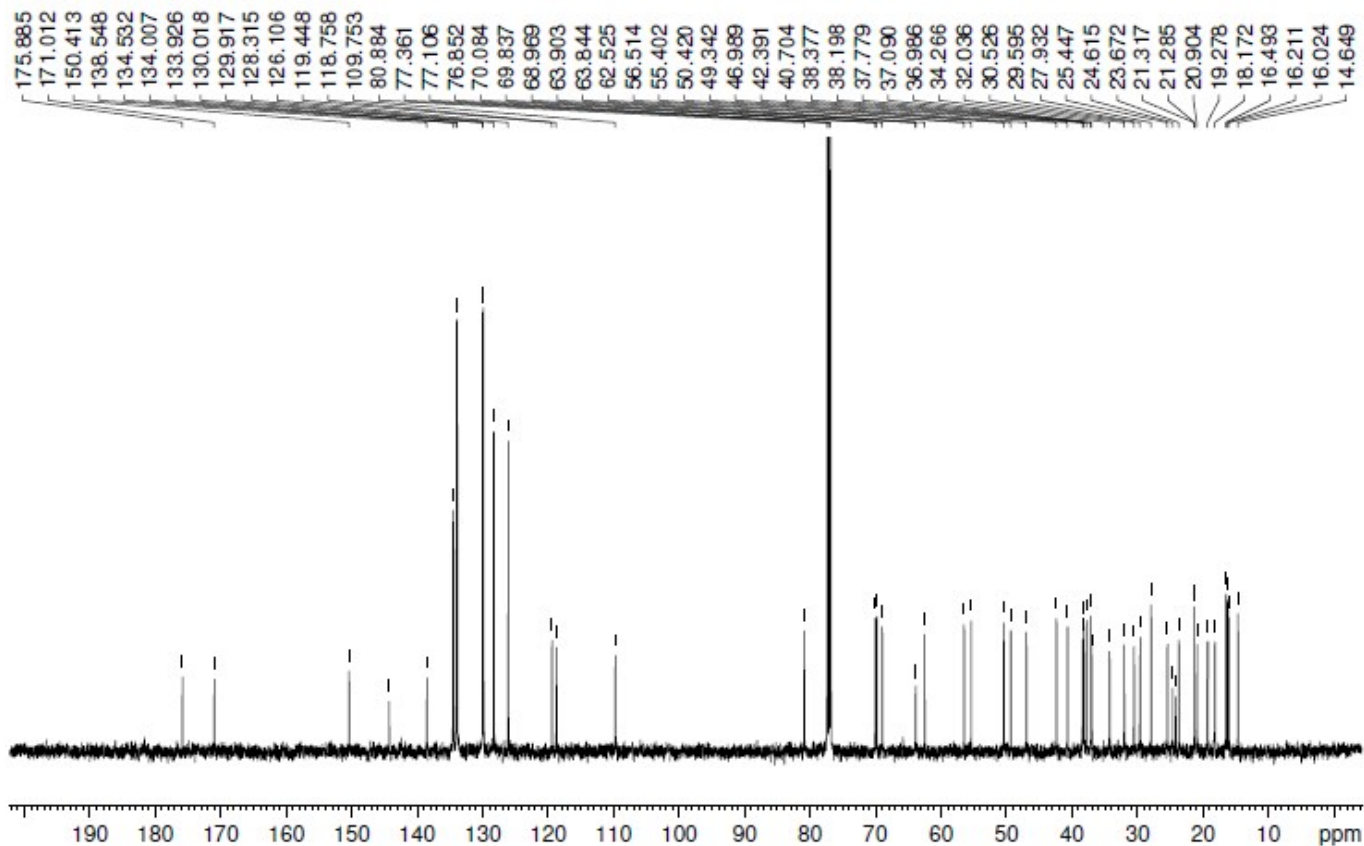
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³¹P NMR spectra (CDCl₃)



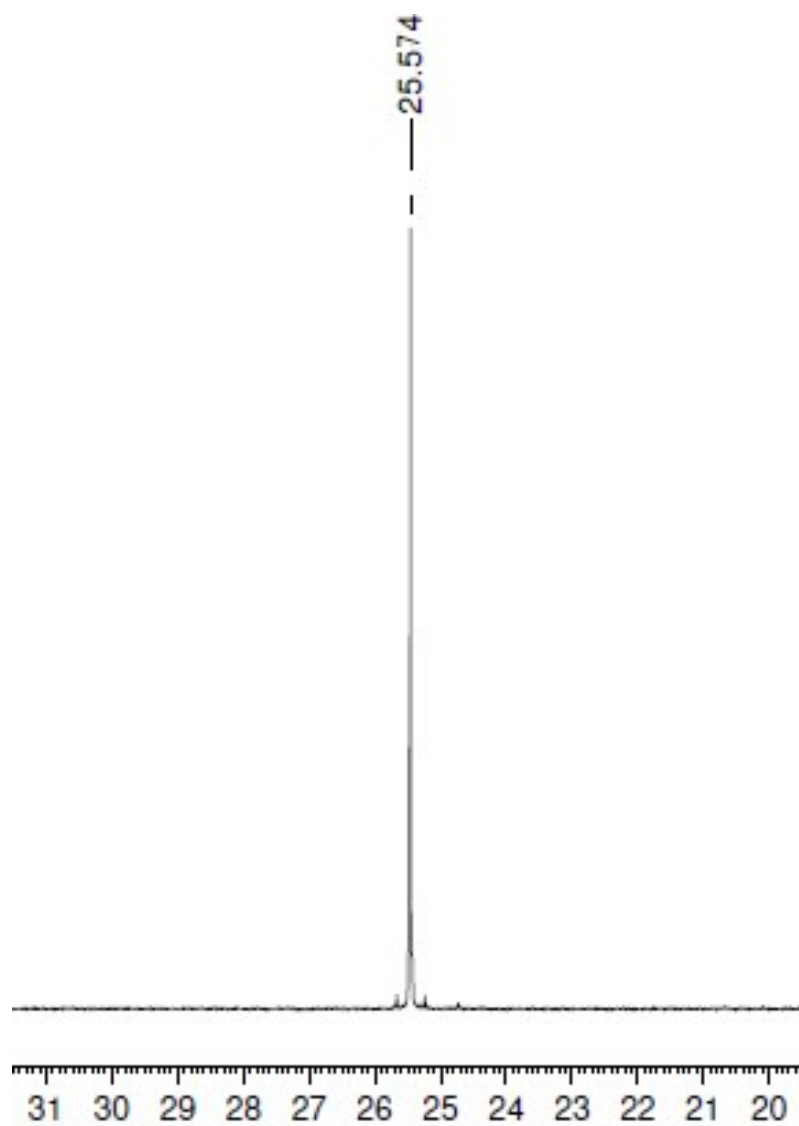
9'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -acetoxylup-20(29)-en-28-oate tosyl 8
¹H NMR spectra (CDCl₃)



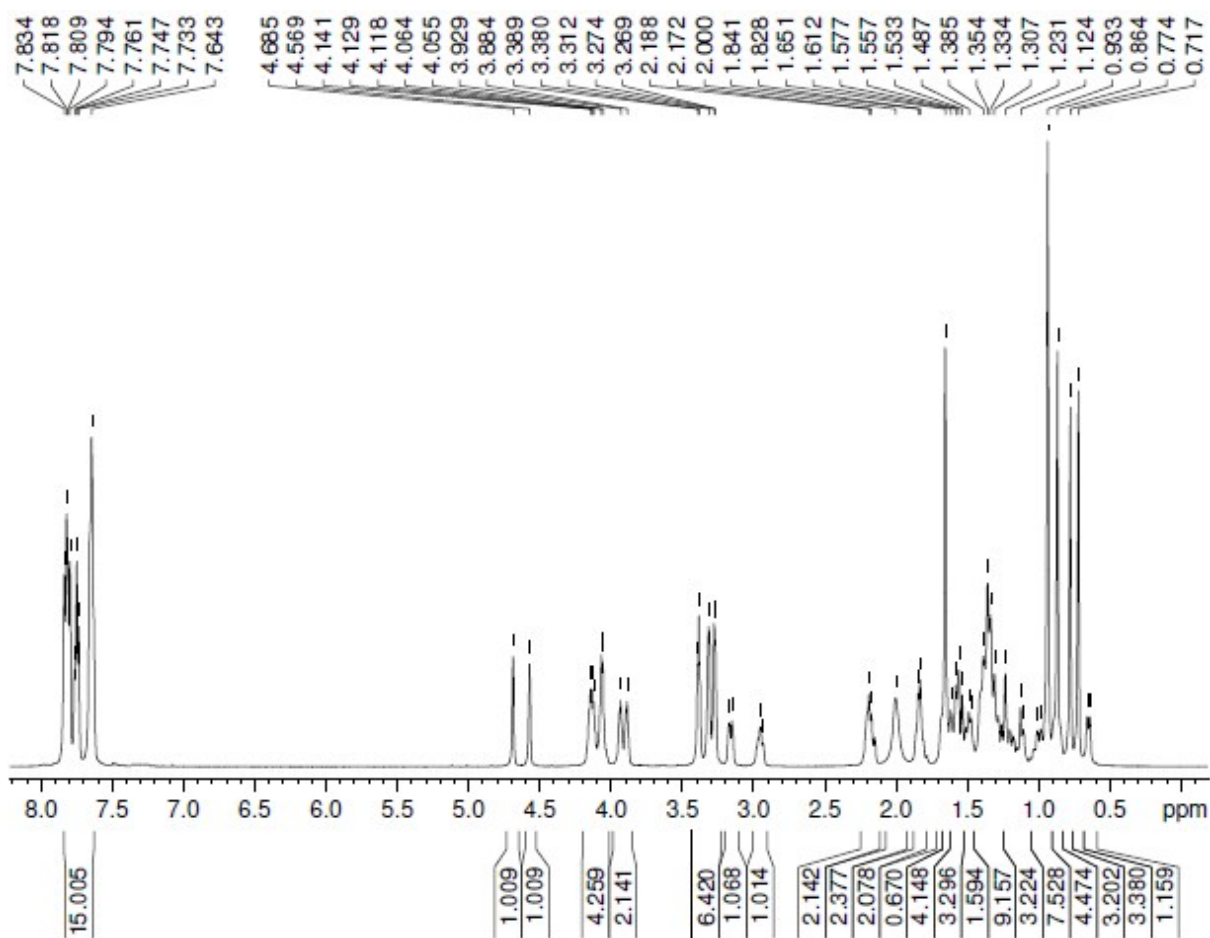
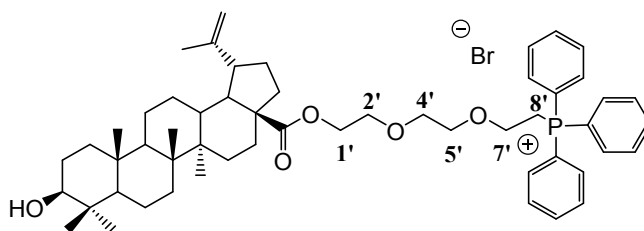
9'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -acetylup-20(29)-en-28-oate tosyl **8**
¹³C NMR spectra (CDCl₃)



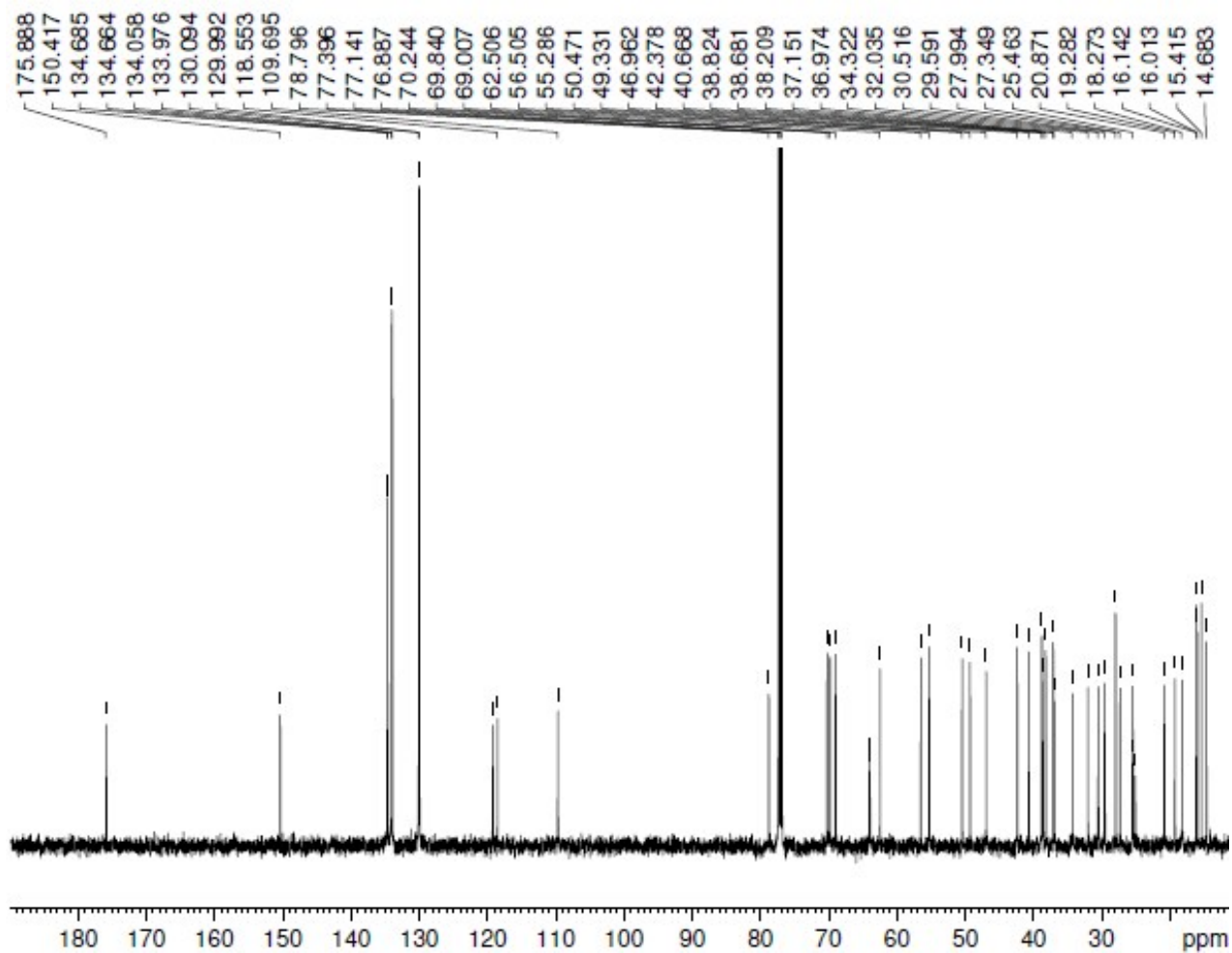
9'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -acetylup-20(29)-en-28-oate tosyl **8**
 ^{31}P NMR spectra (CDCl_3)



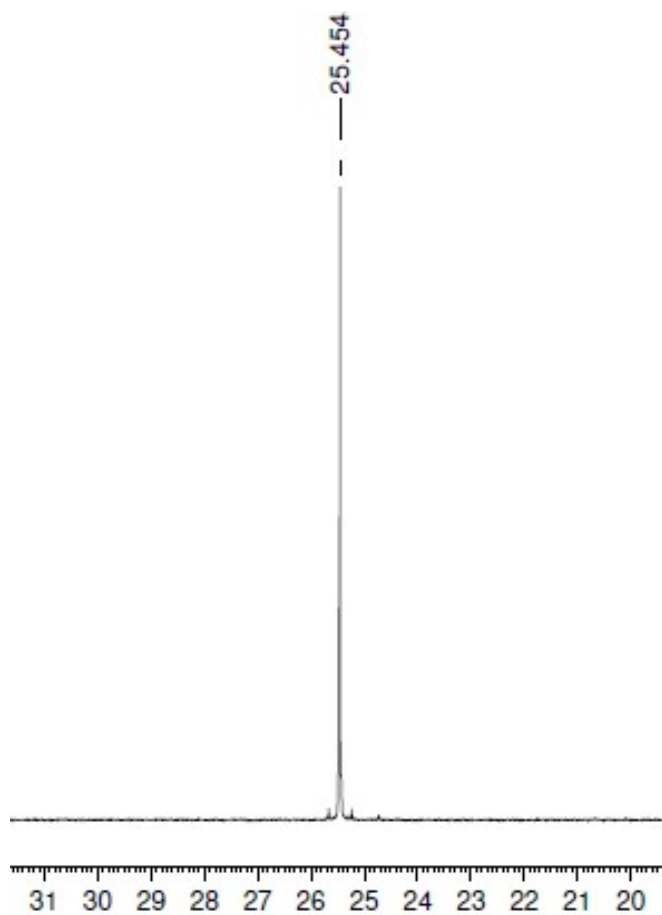
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 ^1H NMR spectra (CDCl_3)



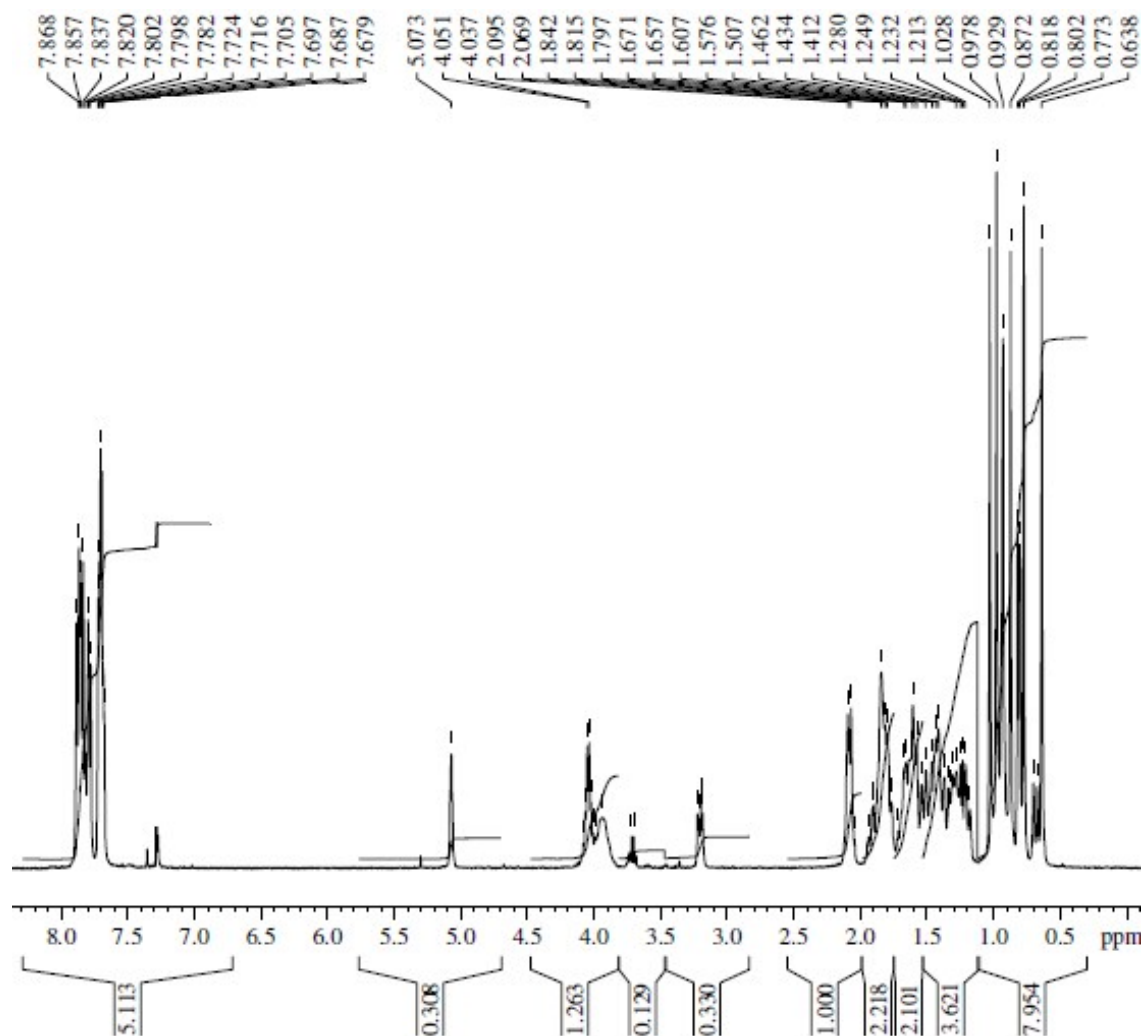
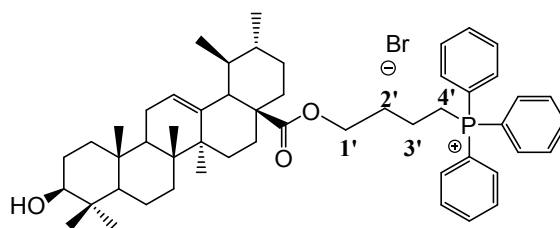
9'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -hydroxylup-20(29)-en-28-oate bromide **9**
 ^{13}C NMR spectra (CDCl_3)



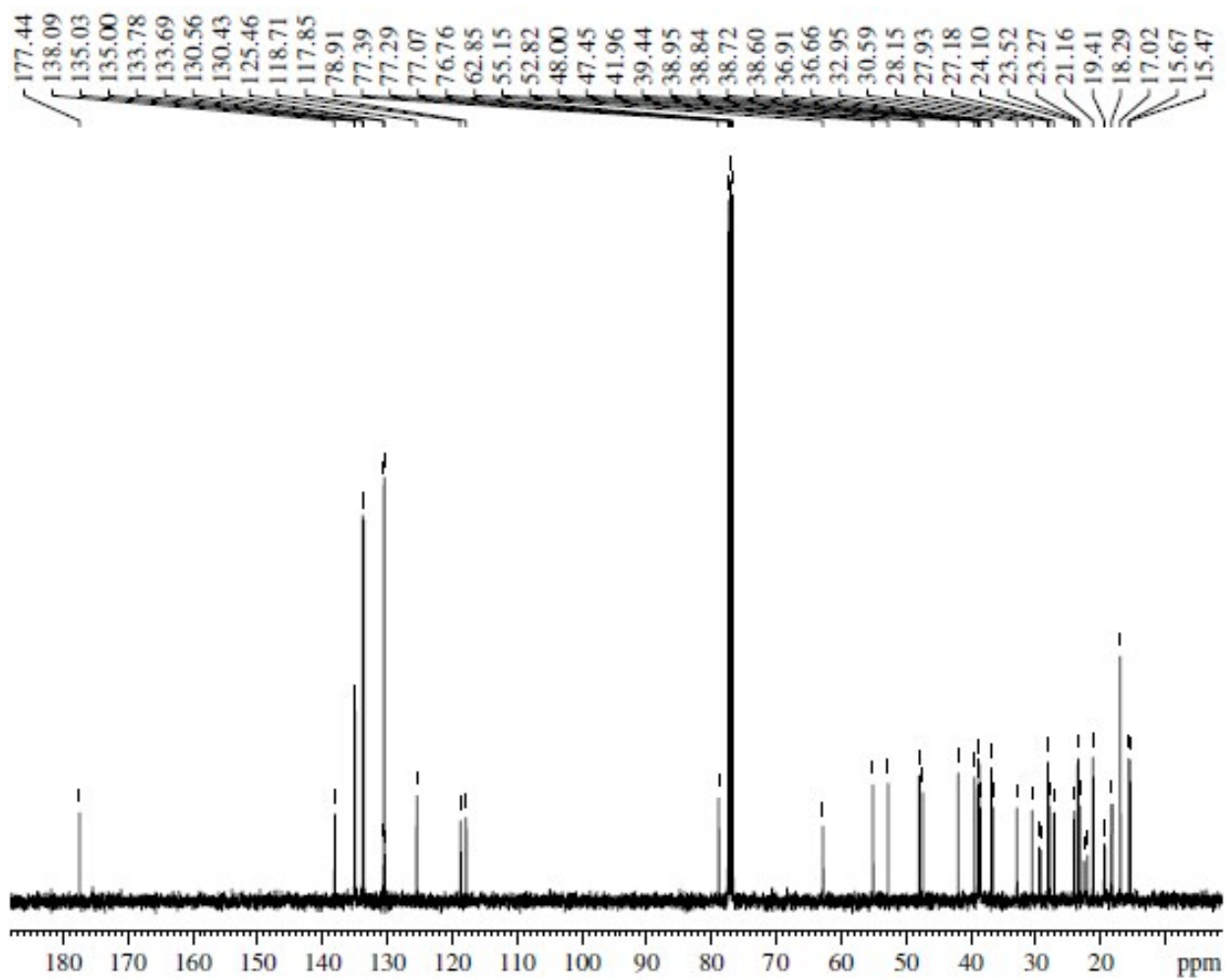
9'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -hydroxylup-20(29)-en-28-oate bromide **9**
 ^{31}P NMR spectra (CDCl_3)



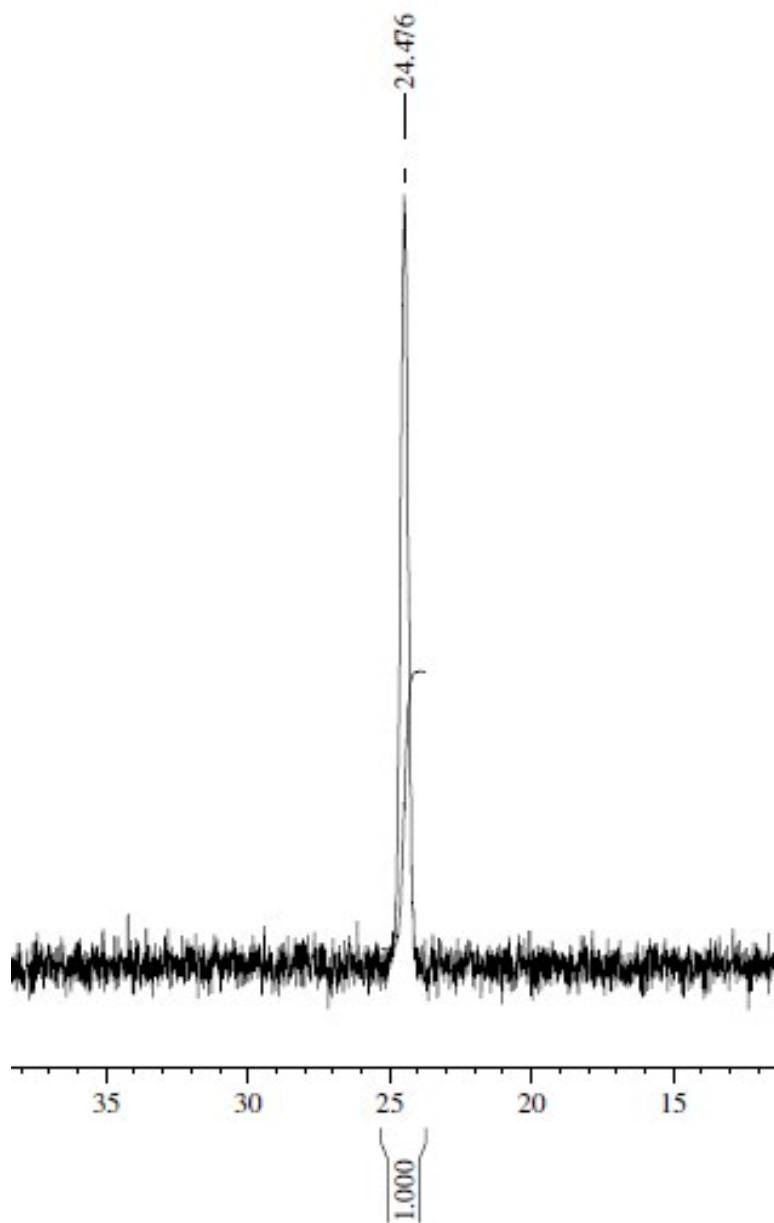
4-(triphenylphosphonio)butyl-3 β -hydroxyurs-12en-28-oate bromide **13**
 ^1H NMR spectra (CDCl_3)



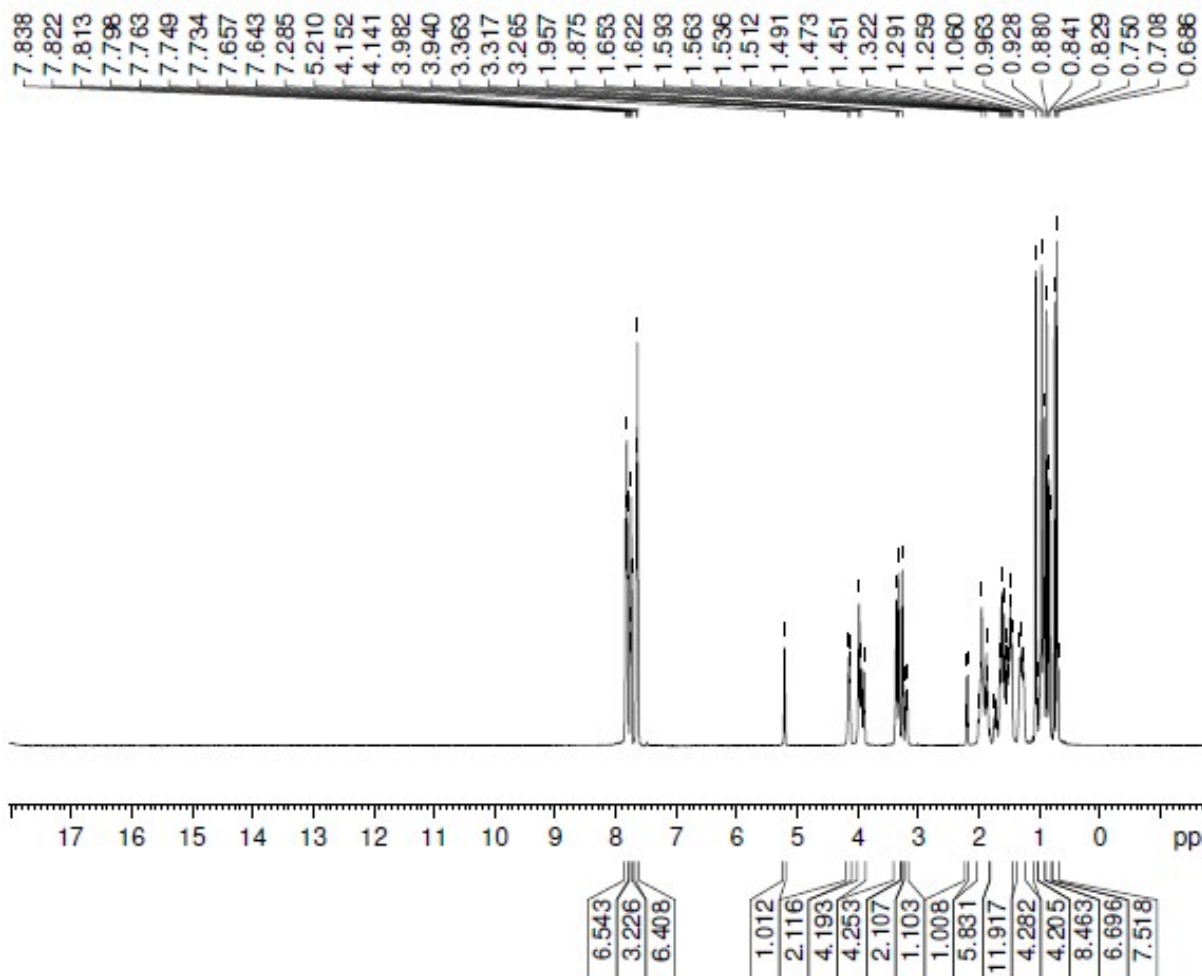
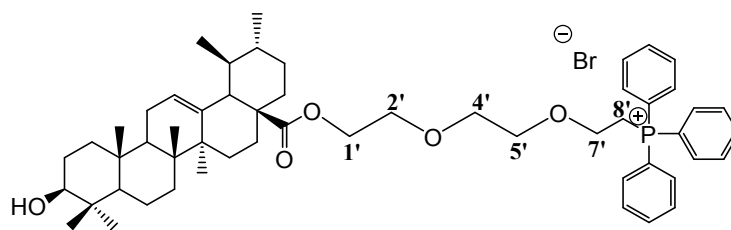
4-(triphenylphosphonio)butyl-3 β -hydroxyurs-12en-28-oate bromide **13**
 ^{13}C NMR spectra (CDCl_3)



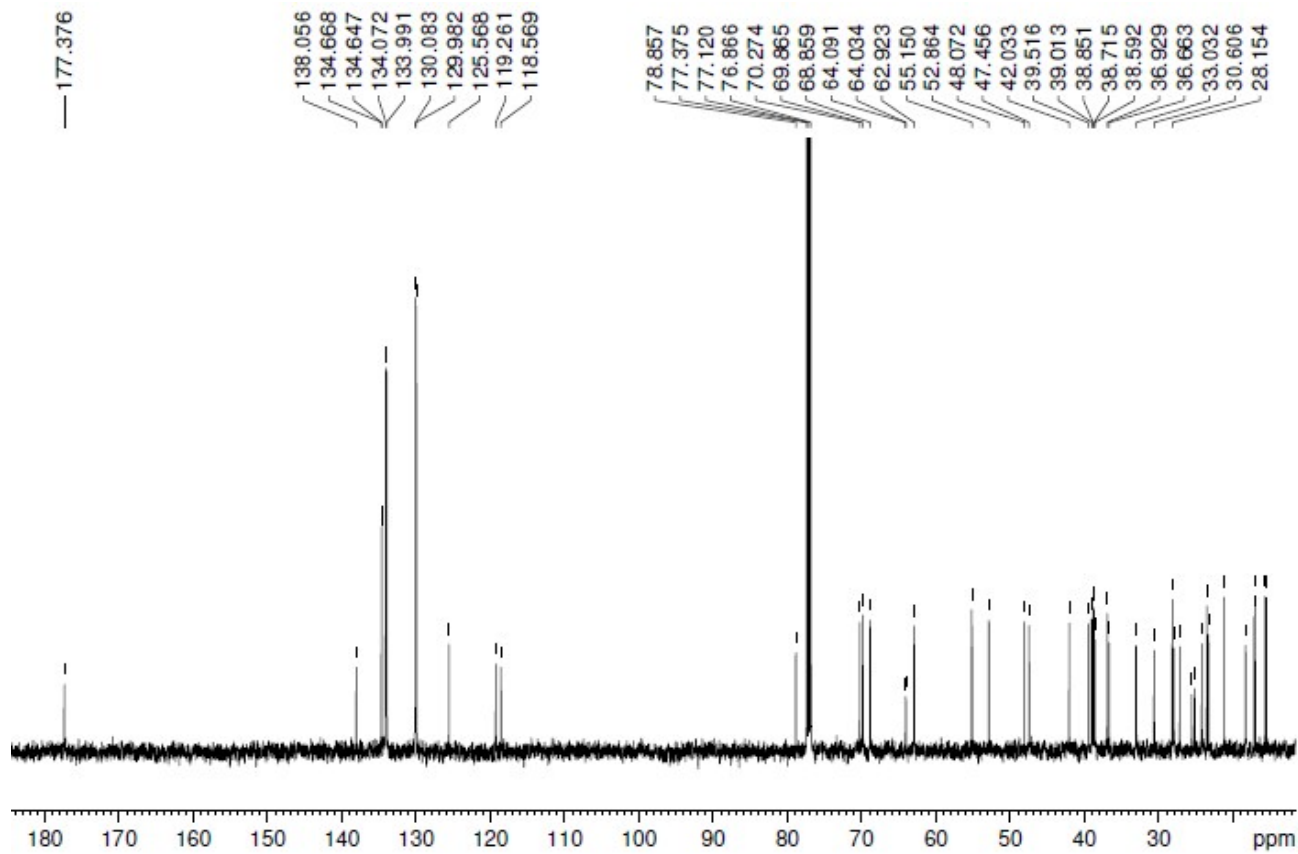
4-(triphenylphosphonio)butyl-3 β -hydroxyurs-12en-28-oate bromide **13**
 ^{31}P NMR spectra (CDCl_3)



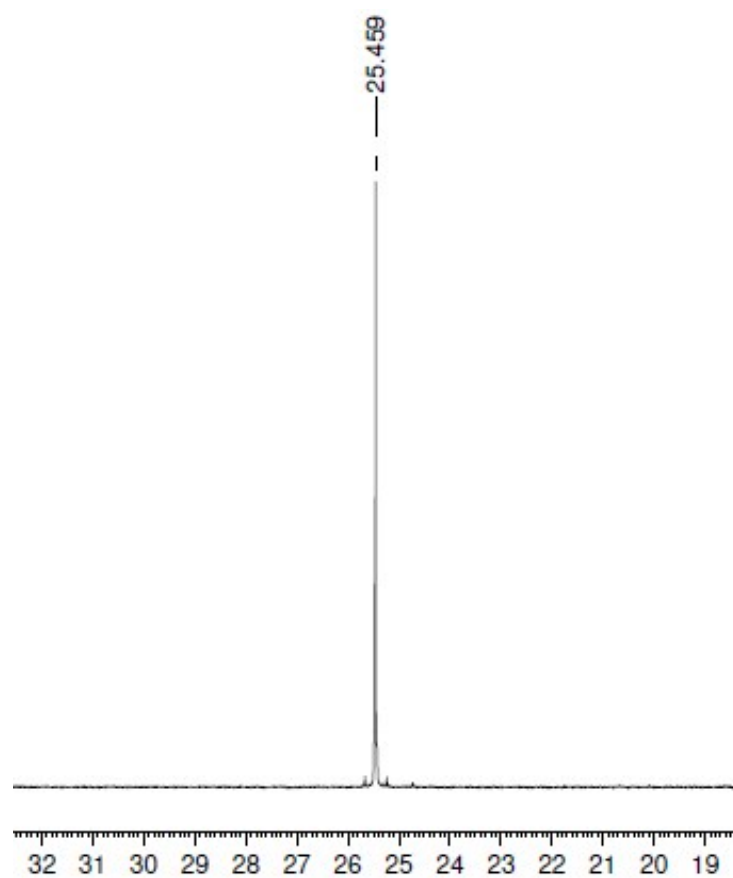
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -hydroxyurs-12-en-28-oate bromide **15**
 ^1H NMR spectra (CDCl_3)



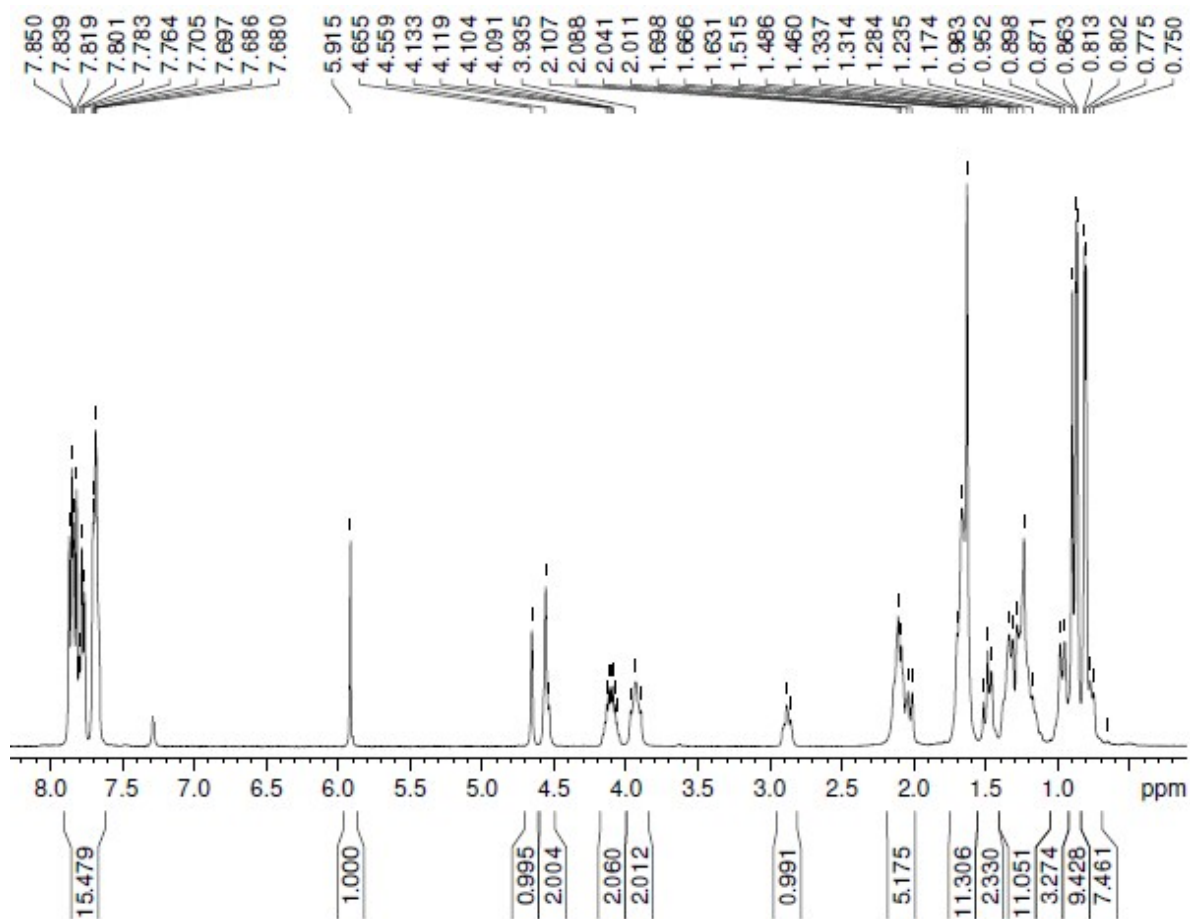
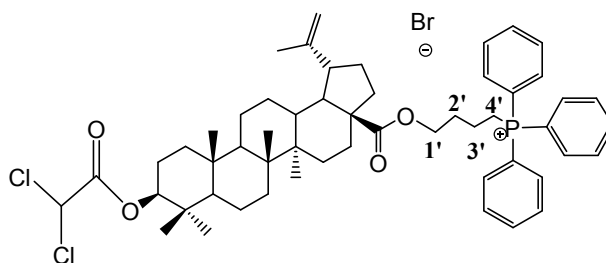
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -hydroxyurs-12en-28-oate bromide **15**
 ^{13}C NMR spectra (CDCl_3)



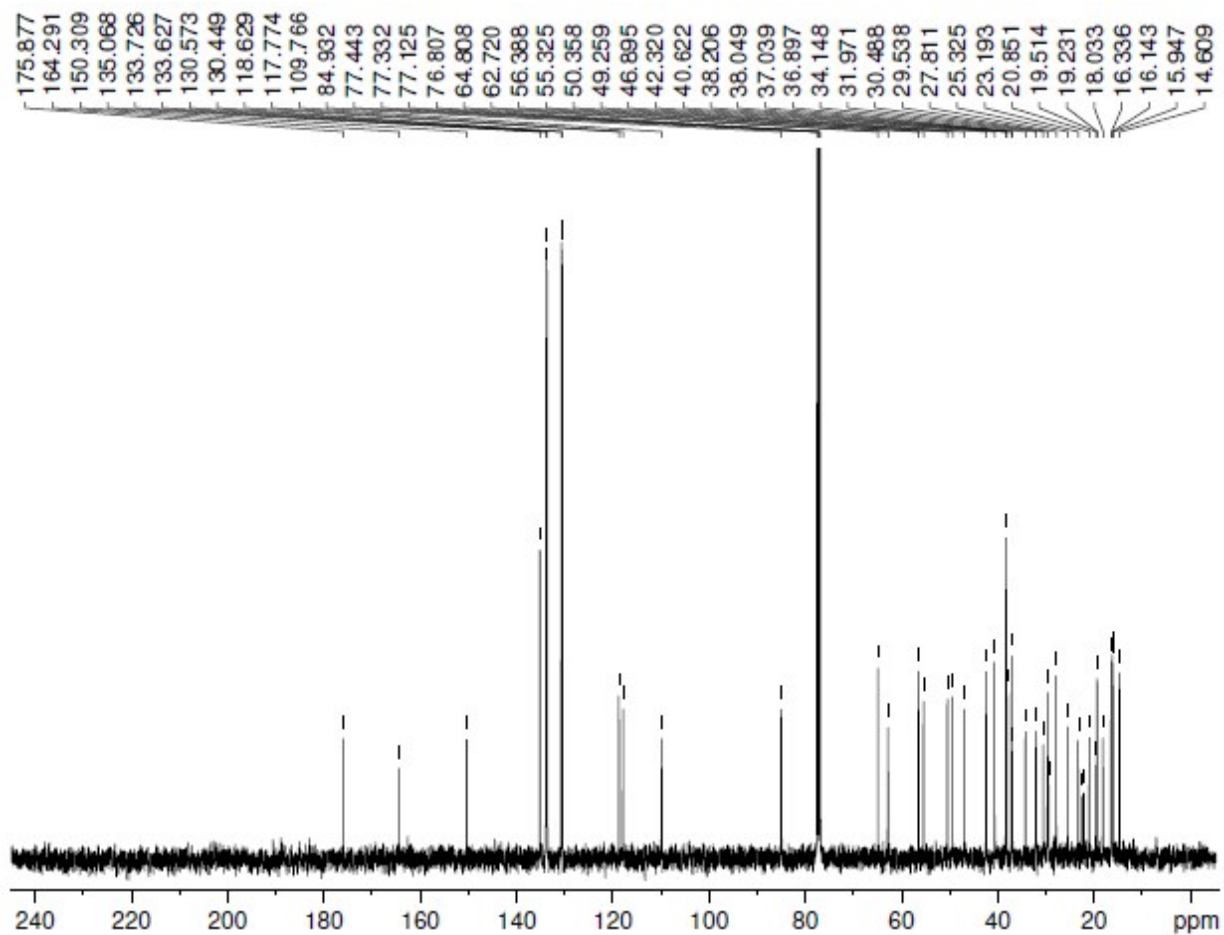
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -hydroxyurs-12en-28-oate bromide **15**
³¹P NMR spectra (CDCl₃)



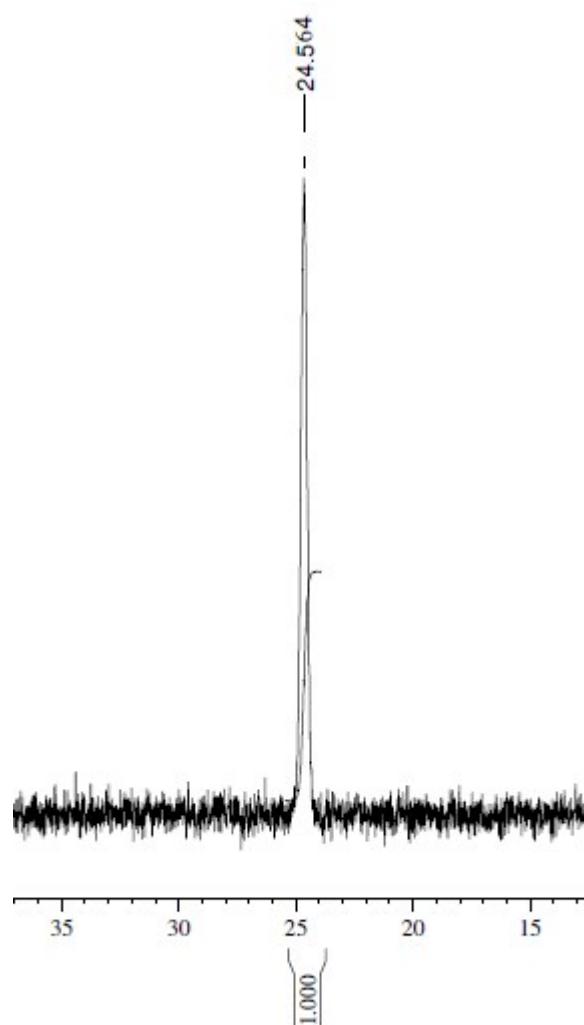
4'-(triphenylphosphonio)butyl-3 β -dichloroacetoxylyup-20(29)-en-28-oate bromide **6**
 ^1H NMR spectra (CDCl_3)



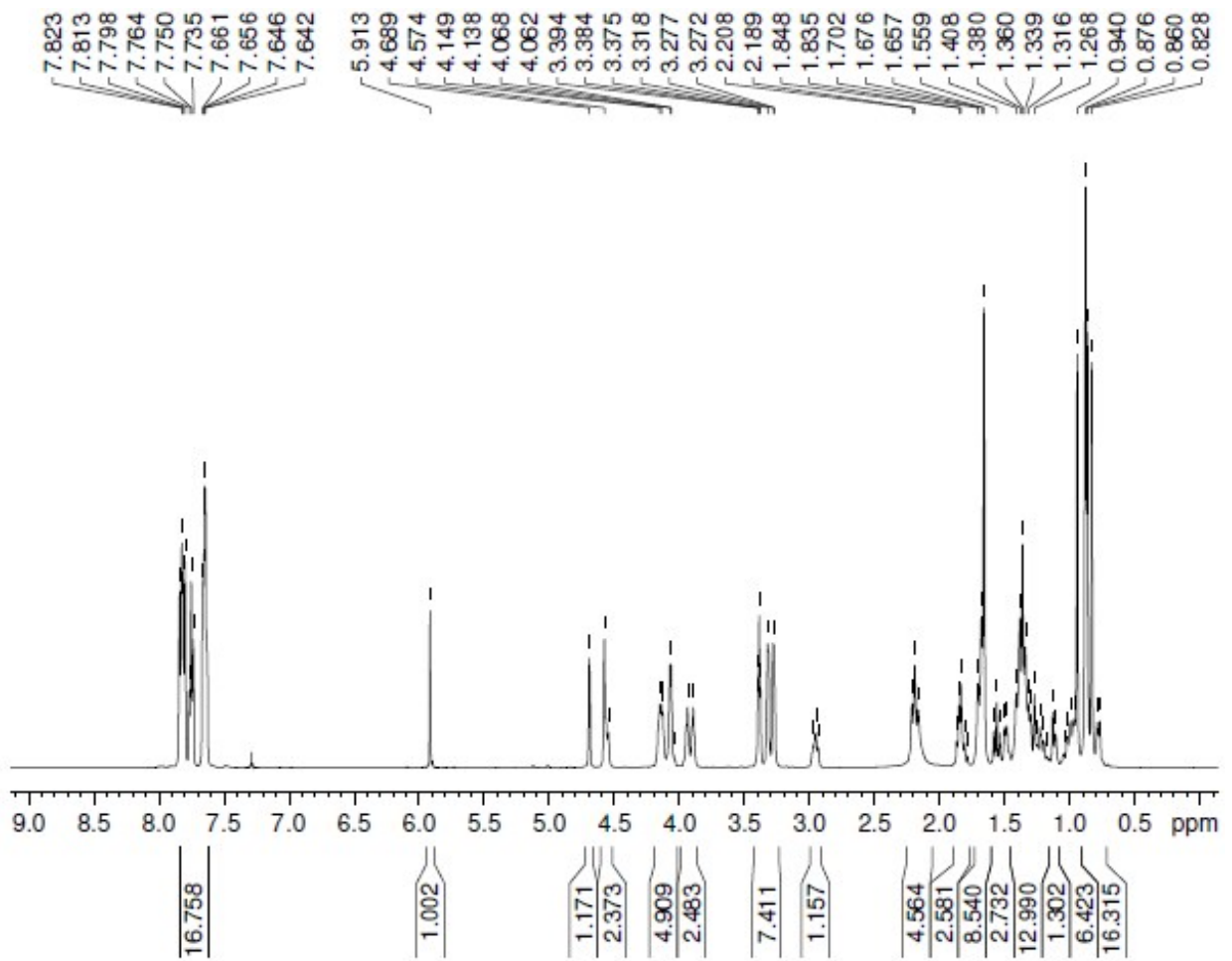
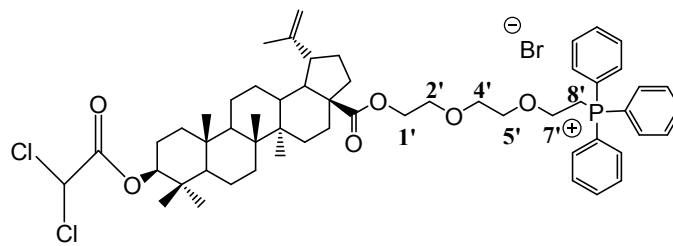
4'-(triphenylphosphonio)butyl-3 β -dichloroacetylup-20(29)-en-28-oate bromide **6**
 ^{13}C NMR spectra (CDCl_3)



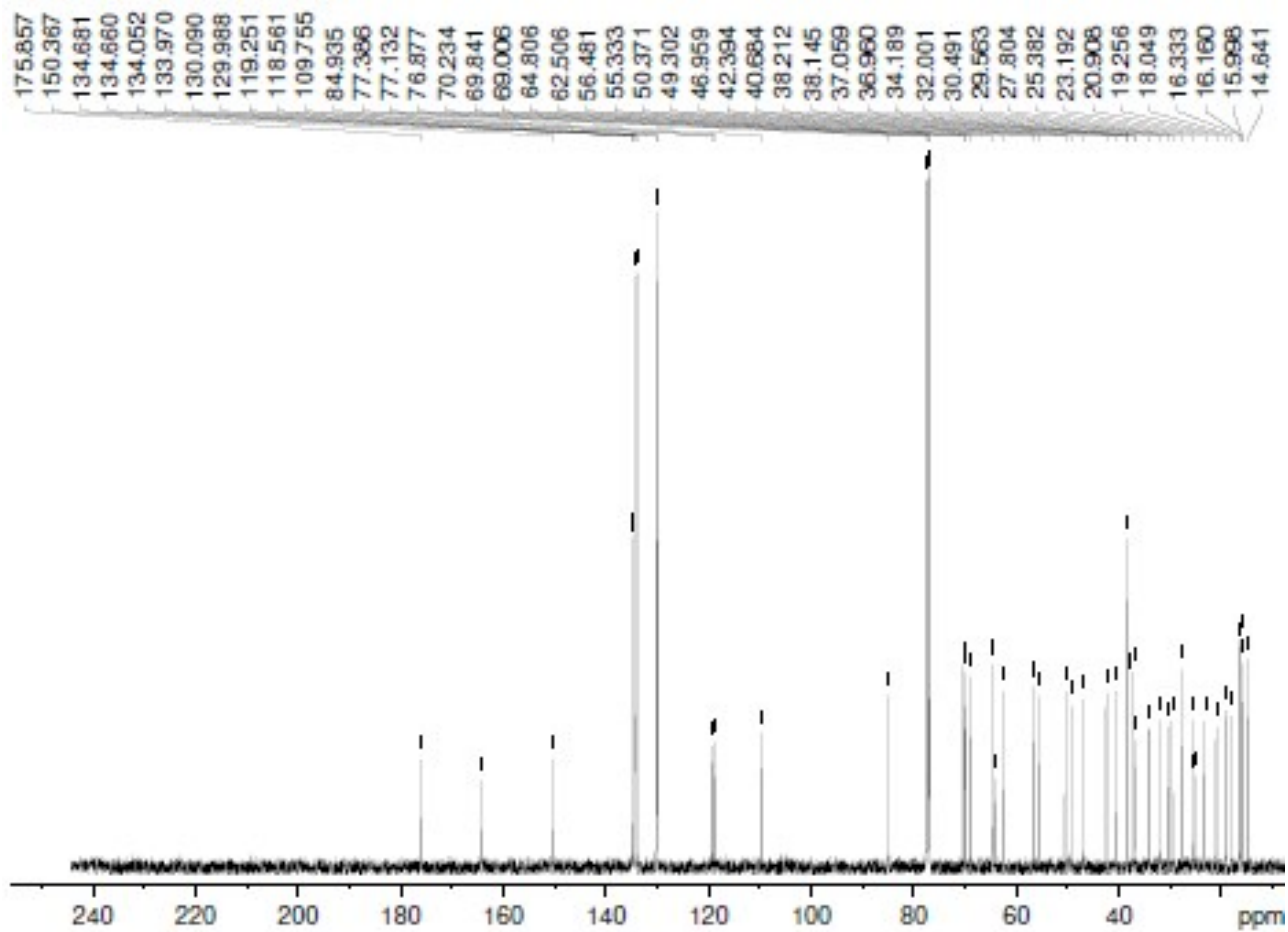
4'-(triphenylphosphonio)butyl-3 β -dichloroacetylup-20(29)-en-28-oate bromide **6**
 ^{31}P NMR spectra (CDCl_3)



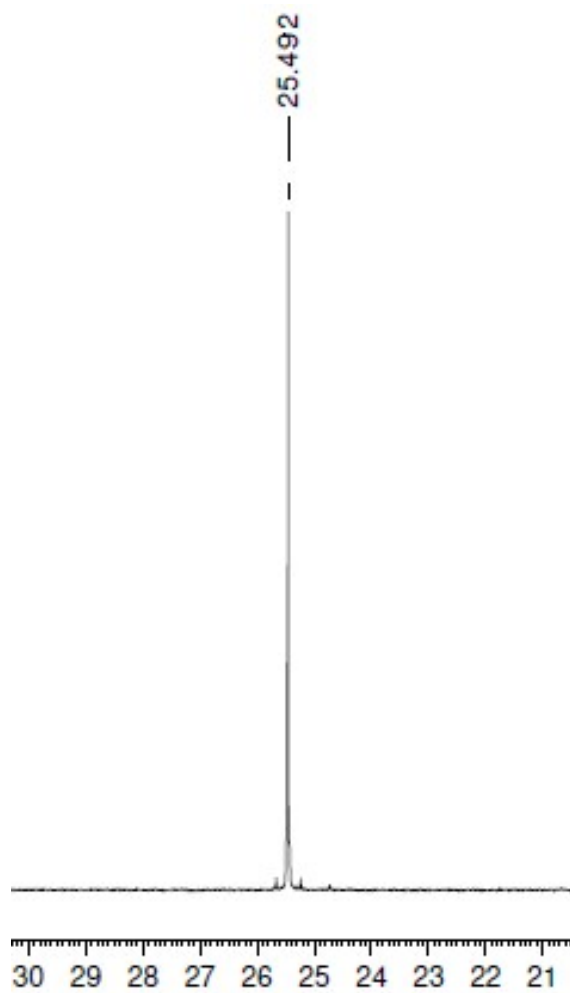
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -dichloroacetoxylop-20(29)-en-28-oate bromide **10**
¹H NMR spectra (CDCl₃)



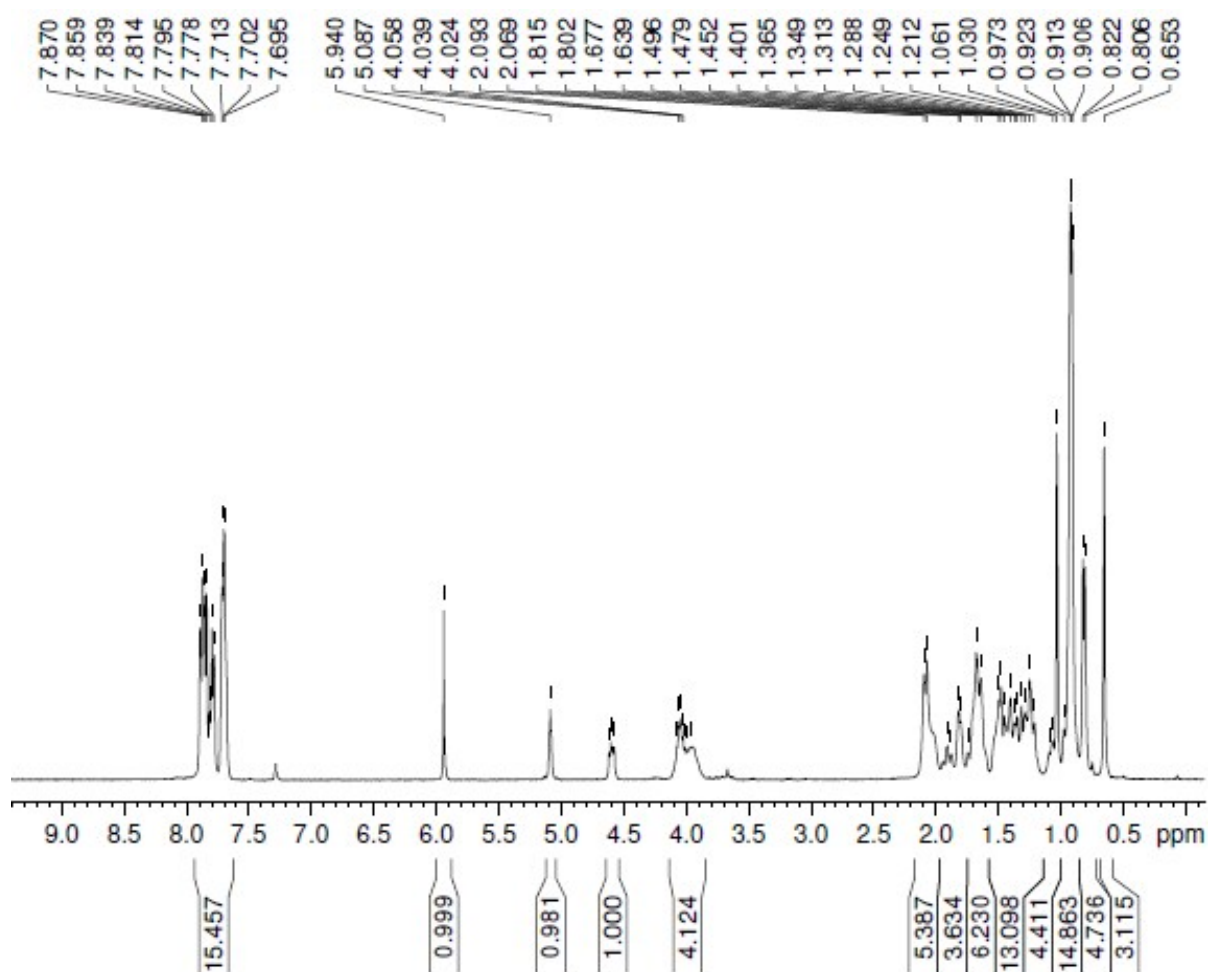
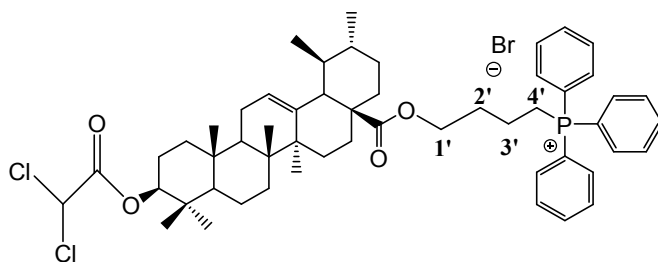
8'--(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -dichloroacetoxylup-20(29)-en-28-oate bromide **10**
¹³C NMR spectra (CDCl₃)



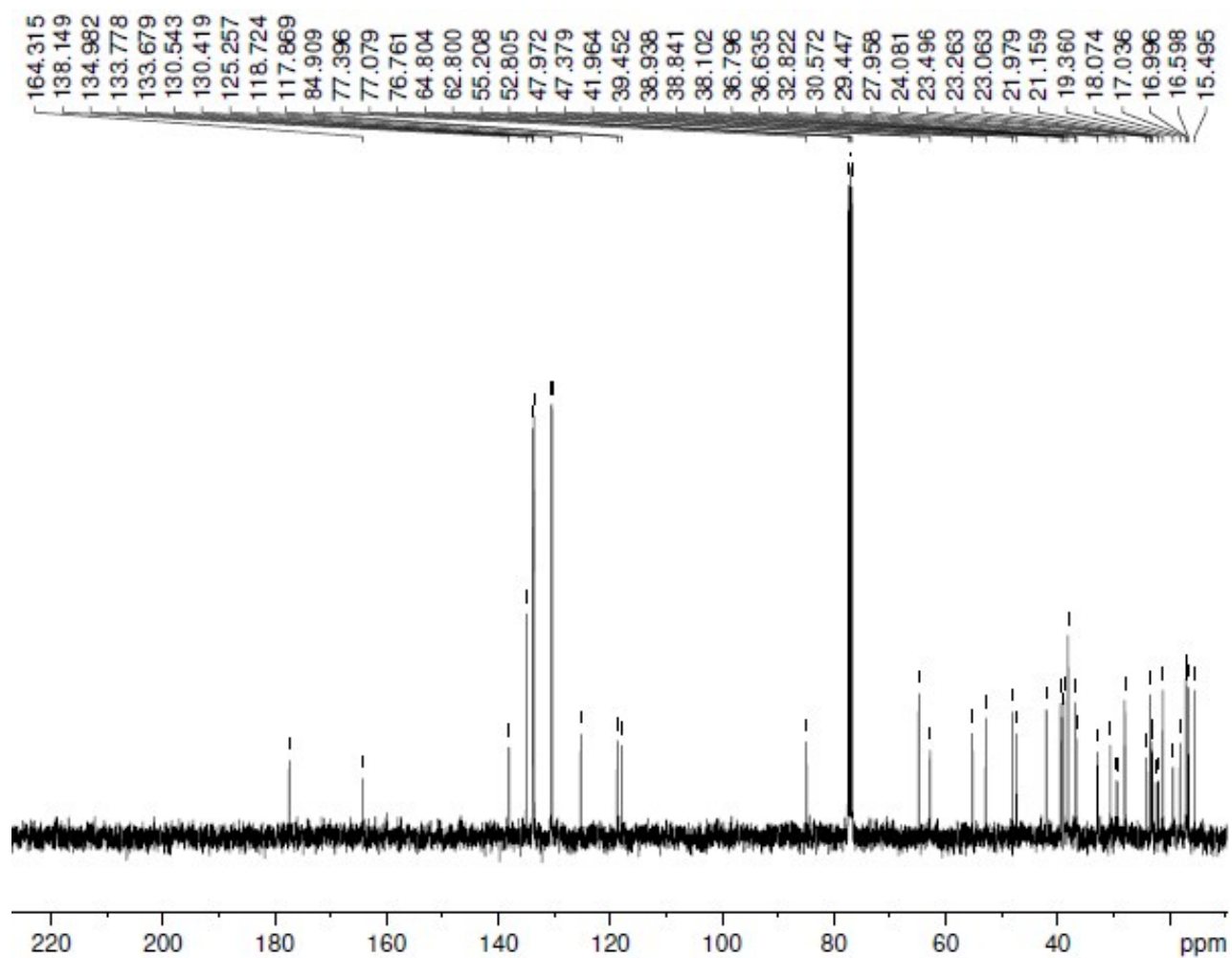
8¹-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -dichloroacetylup-20(29)-en-28-oate bromide **10**
³¹P NMR spectra (CDCl₃)



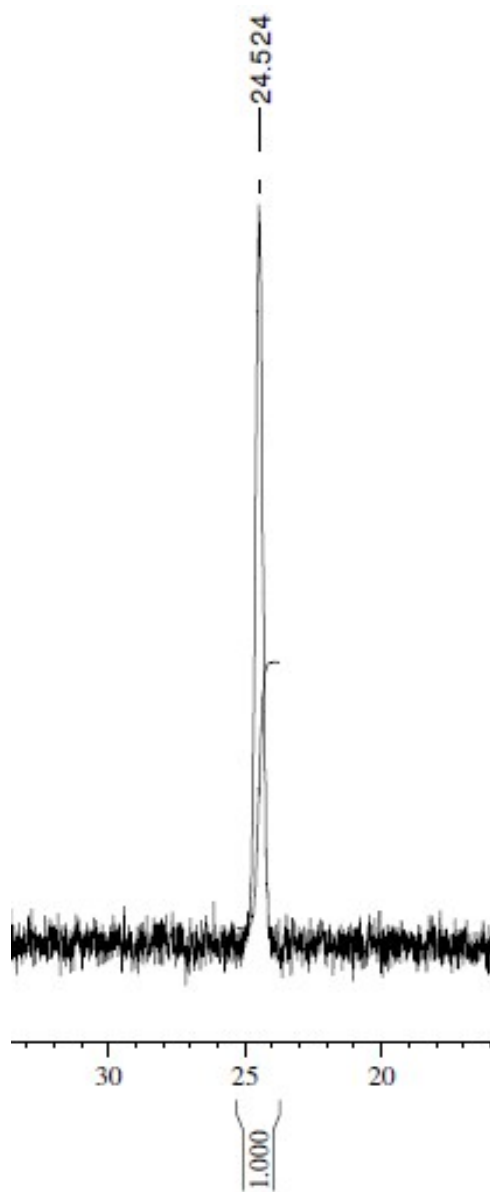
4'-(triphenylphosphonio)butyl-3 β -dichloroacetoxyurs-12en-28-oate bromide **14**
 ^1H NMR spectra (CDCl_3)



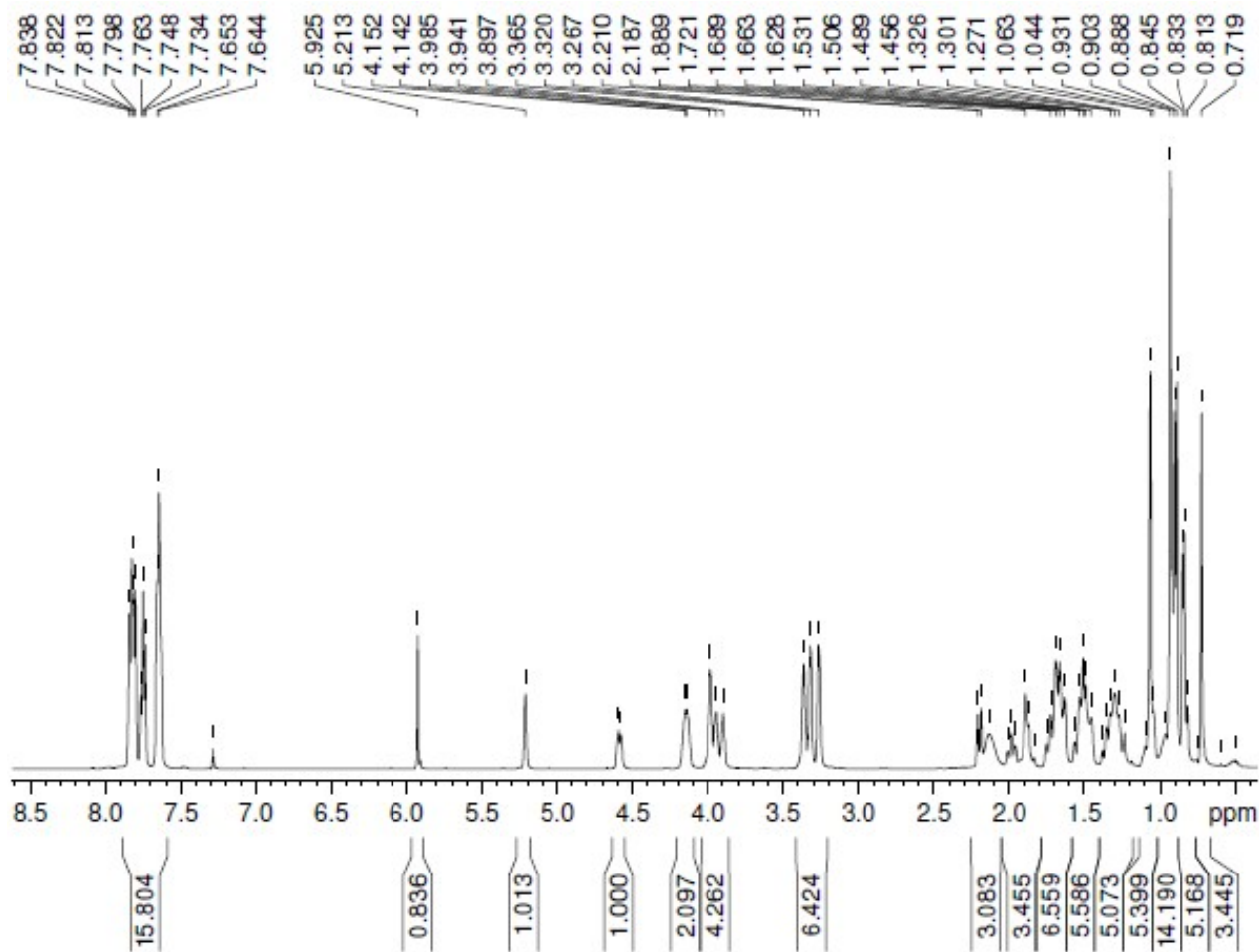
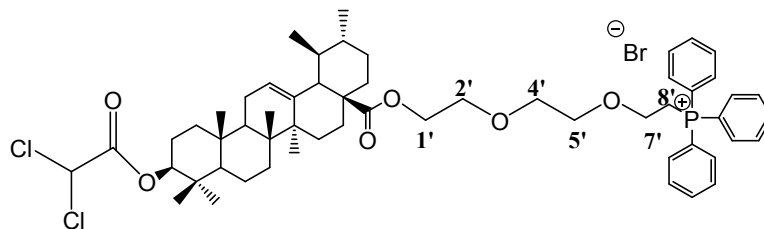
4'-(triphenylphosphonio)butyl-3 β -dichloroacetoxyurs-12en-28-oate bromide **14**
 ^{13}C NMR spectra (CDCl_3)



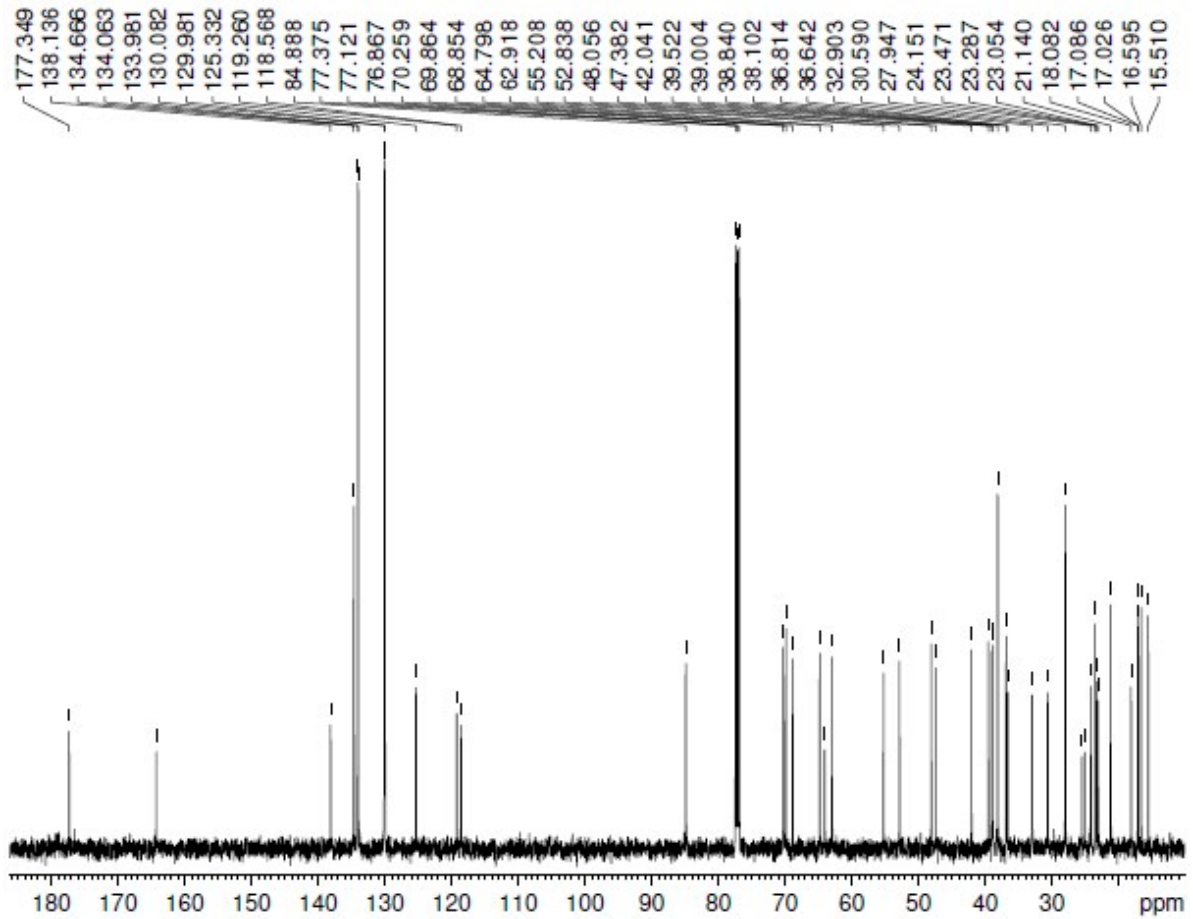
4'-(triphenylphosphonio)butyl-3 β -dichloroacetoxyurs-12en-28-oate bromide **14**
 ^{31}P NMR spectra (CDCl_3)



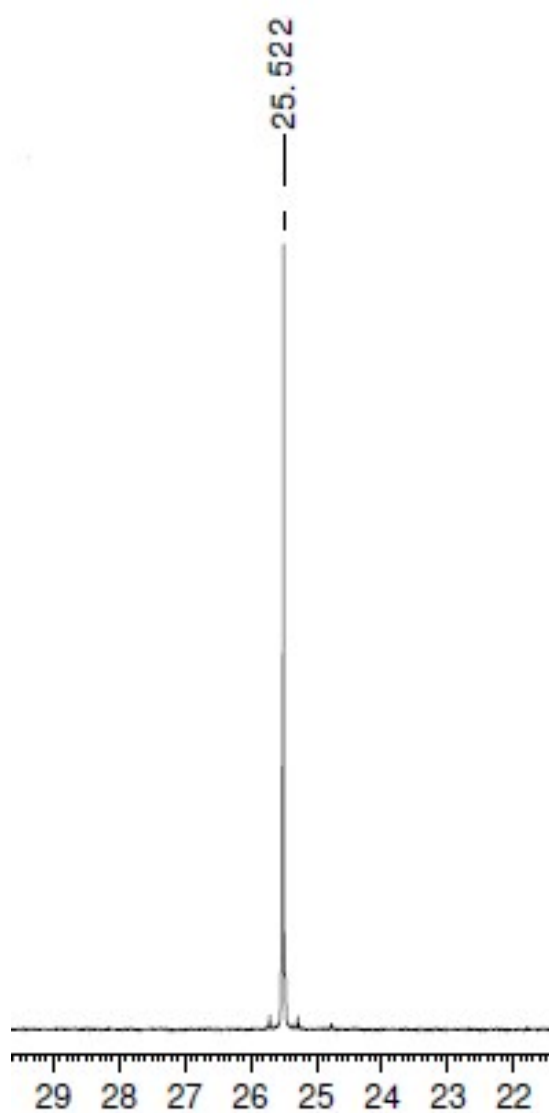
8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -dichloroacetoxyurs-12en-28-oate bromide **16**
 ^1H NMR spectra (CDCl_3)



8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -dichloroacetoxyurs-12en-28-oate bromide **16**
 ^{13}C NMR spectra (CDCl_3)

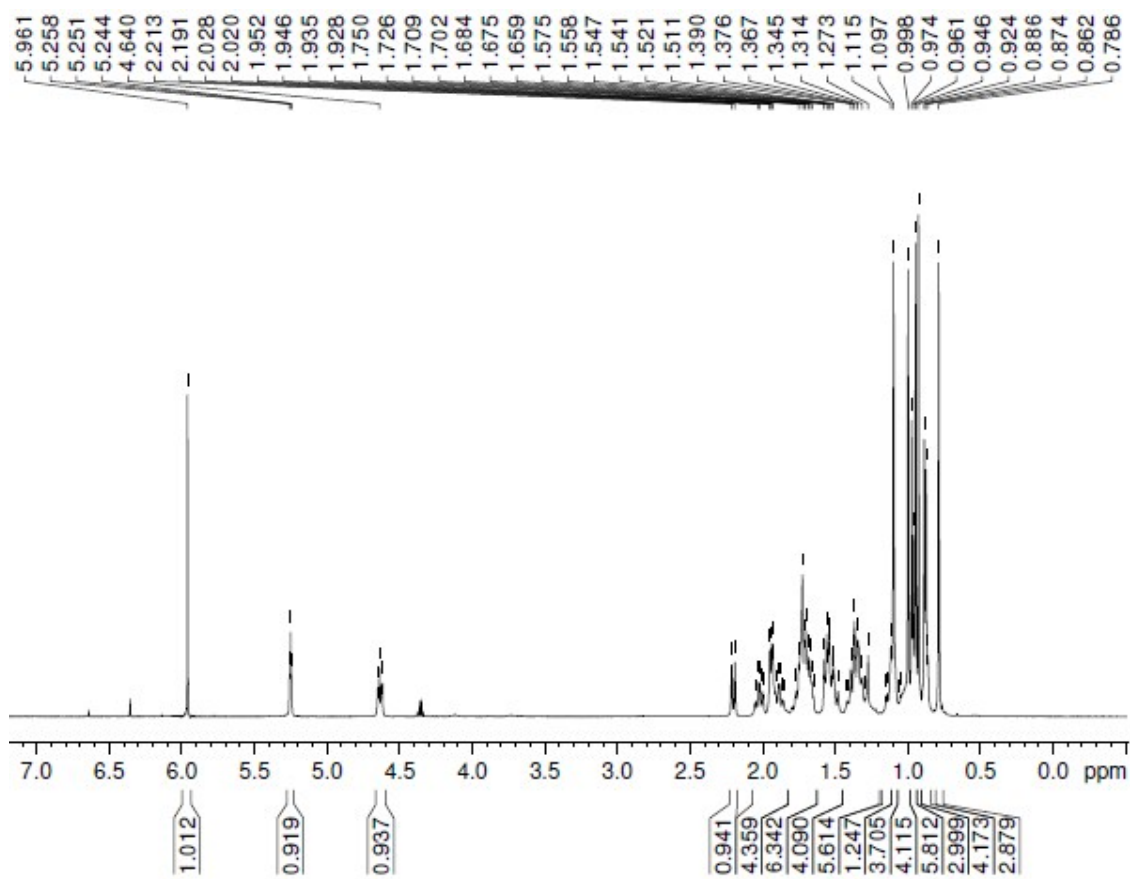
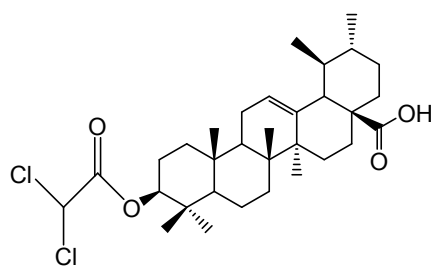


8'-(triphenylphosphonio-3',6'-dioxaoctan-1'-yl)-3 β -dichloroacetoxyurs-12en-28-oate bromide **16**
 ^{31}P NMR spectra (CDCl_3)

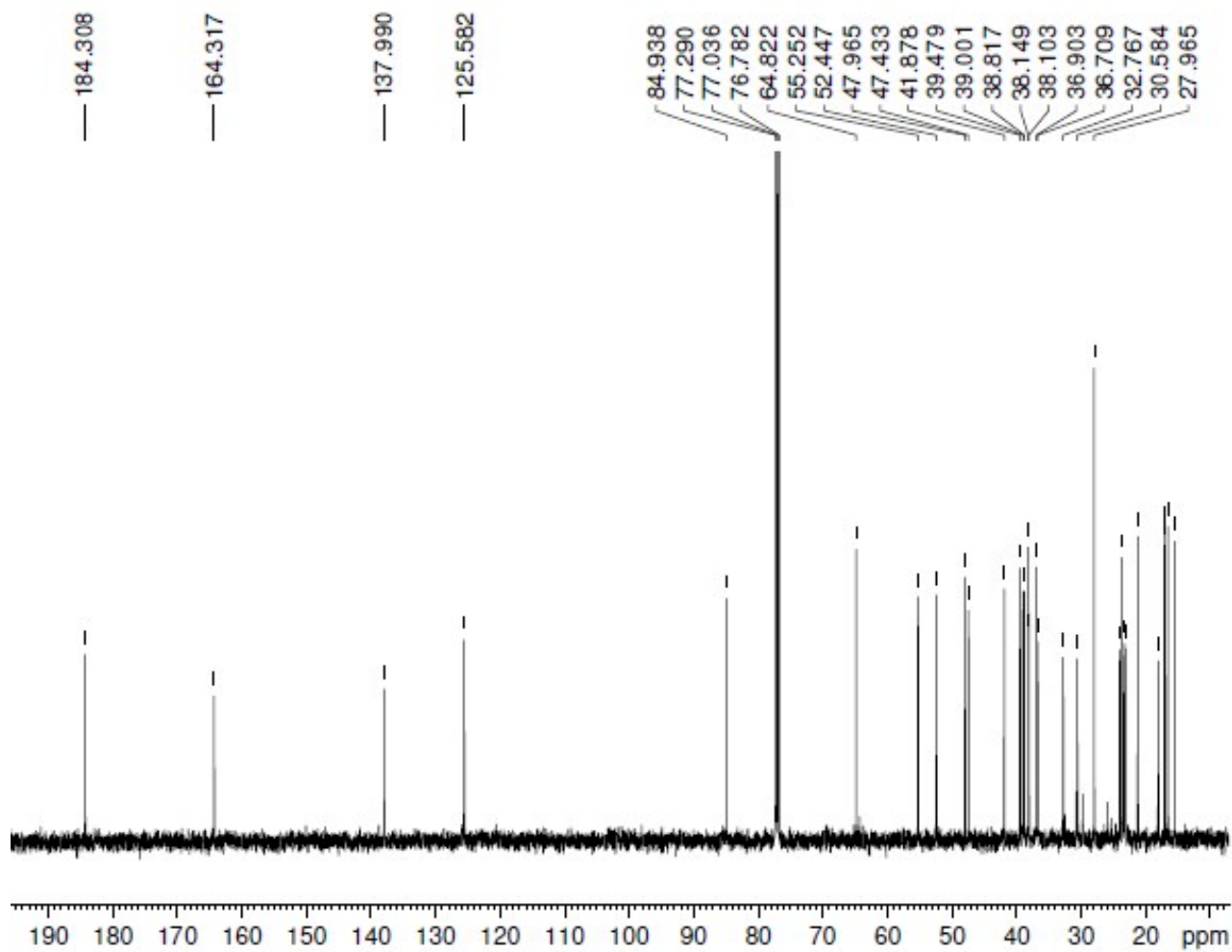


3 β -dichloroacetoxyurs-12en-28-oic acid **UA-DCA**

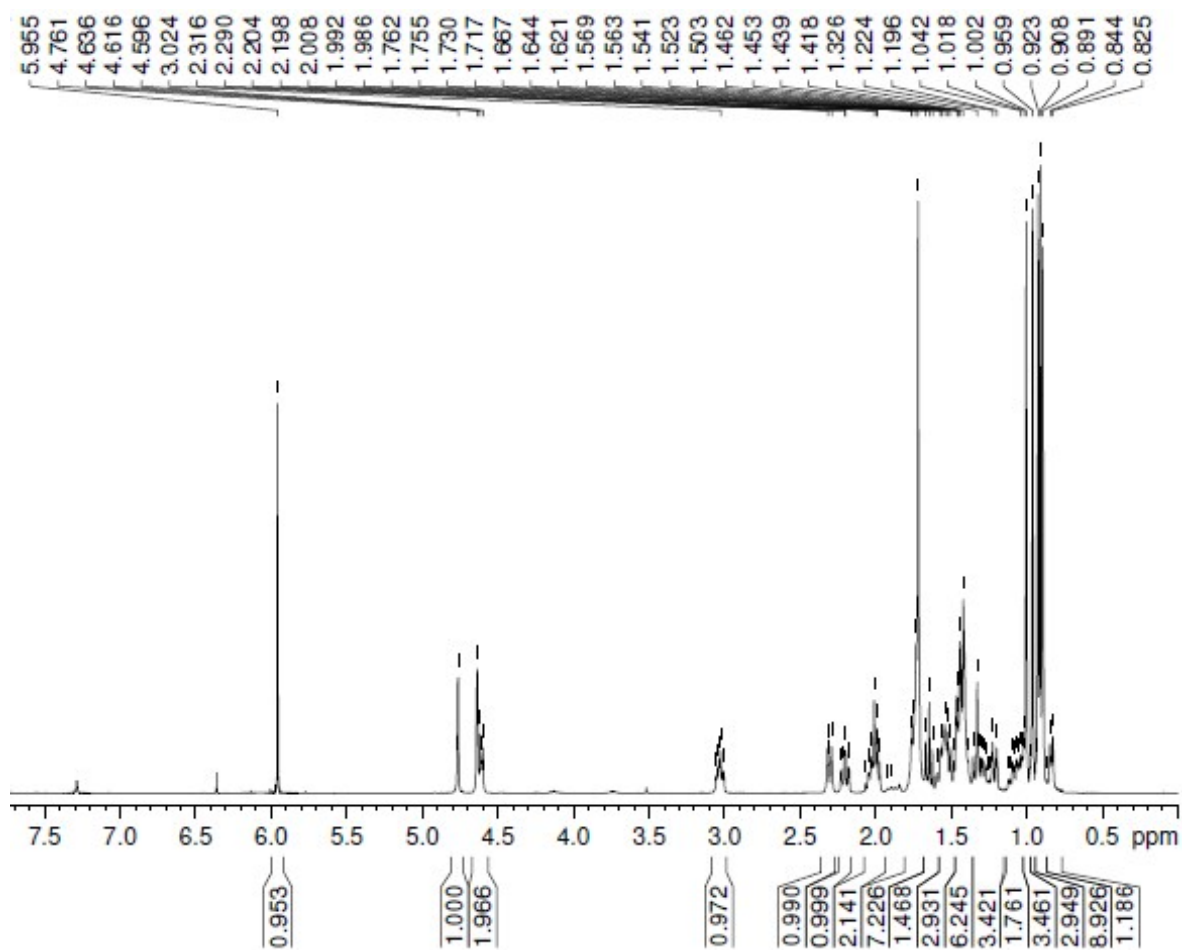
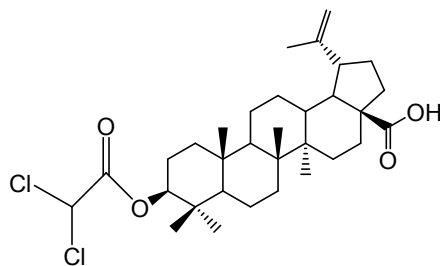
^1H NMR spectra (CDCl_3)



3 β -dichloroacetoxyurs-12en-28-oic acid **UA-DCA**
¹³C NMR spectra (CDCl₃)



3 β -dichloroacetylup-20(29)-en-28-oic acid **BA-DCA**
 ^1H NMR spectra (CDCl_3)



3 β -dichloroacetylup-20(29)-en-28-oic acid **BA-DCA**
¹³C NMR spectra (CDCl₃)

