UDK 547-324, 547-326.

PALMITIN VA ITAKON KISLOTALARNING N-GIDROGSIALKILFTALIMIDLAR BILAN REAKSIYALARI

Sh.B. To‘rayev, M.R.Yuldasheva

N-gidroksimetilftalimidning palmitin, itakon kislotalari va N-gidroksietilftalmidning palmitin kislotasi bilan reaksiyasi sulfat kislota katalizatori ishtirokida benzol erituvchisida olib borildi. N-gidroksimetilftalimidning palmitin va itakon kislotalari bilan reaksiyasi natijasida asosiy reaksiya sifatida aromatik halqada elektrofil almashinish borib, benzol hosilasi yuzaga kelgani aniqlandi. Olingan birikmalarning tuzilishi IQ- va xromotomass spektrlari yordamida tahlil qilindi.

Kalit so‘zlar: N-*gidroksimetilftalimid, N-gidroksietilftalimid, palmitin kislota, itakon kislota, amidoalkillash, murakkab efirlar.*

Реакцию N-гидроксиметилфталимида с пальмитиновой и итаконовой кислотами и N-гидроксиэтилфталимида с пальмитиновой кислотой проводили в бензольном растворителе в присутствии катализатора серной кислоты. Реакция N-гидроксиметилфталимида с пальмитиновой и итаконовой кислотами показала, что основной реакцией является электрофильный обмен в ароматическом кольце с образованием бензольного продукта. Строение полученных соединений проанализировано с помощью ИК-и хромотомассового спектров.

Ключевые слова: *N-гидроксиметилфталимид, N-гидроксиэтилфталимид, пальмитиновая кислота, итаконовая кислота, амидоалкилирование, сложные эфиры.*

Kirish

Ftalkislota va uning hosilalari kimyo sanoati va farmatsevtikada keng qo‘llaniladi [1. B. 7]. Ftalimidlar siklikimidlar guruhiga kiradi va umumiy azotga bog‘langan ikkita karbonilga xos kimyoviy xususiyatga ega. Geterosiklik birikmalar kimyosi organik kimyoning eng murakkab tarmoqlaridan biridir. Geterosiklik birikmalar biologik jarayonlarda muhim rol o‘ynaganligi uchun tadqiqotchilar geterosiklik birikmalar kimyosini tushunishga harakat qilmoqdalar [2 .B. 3354].

5 a’zoli N-geterosiklik birikmalar farmatsevtika sanoatida alohida qiziqish uyg‘otadi, chunki ular bir nechta dorilarning asosiy tarkibida uchraydi. O‘zgartirilgan ftalimidlar asosan organik sintezda xiral qurilish materiallari sifatida ishlatiladi va bioaktiv birikmalar [3. B. 159–171], ya‘ni antibakterial [4. B. 378–384], og‘riq qoldiruvchi [5. B. 1817–1825], yallig‘lanishga qarshi vositalar va antioksidantlar sifatida qayd etilgan [6. B. 23].

Geterotsiklik birikmalar orasida ftalimidlar alohida biologik ahamiyatga ega va ular gerbitsidlar, o‘simliklarning o‘sish regulyatorini tayyorlashda, shuningdek, bo‘yoq sanoatida asosiy vositalar sifatida ishlatilishi mumkin. O‘zlarining qulay fotofizik va elektrokimyoviy xususiyatlari tufayli ftalimidlar har xil yuqori samarali fotodekarboksillanish reaksiyalariga kirishadilar [7 .B. 634].

Ftalimidlarni birlamchi aminning himoya qiluvchi guruh sifatida ishlatilishi adabiyotlarda keltirilgan [6. B. 23]. N-ftalimid hosilalari, aminning ftal angidrid bilan kondensasiyalanishi yordamida organik erituvchilarda ko‘plab usullarda sintez qilingan [2. B. 3354]. Odatda, organik sintezda ular turli xil bioaktiv birikmalar sintezi uchun boshlang‘ich materiallar va oraliq moddalar sifatida ishlatiladi. N-atsetoksifalimidlar fotodekarboksillanish orqali imidil va alkil radikallarining ko‘p qirrali vakillari bo‘lib, keyinchalik turli xil birikish reaksiyalari uchun ishlatilgan [8. B. 534–537].

N-metilolftalimid bilan amidometillash reaksiyalari indol hosilalarida ham batafsil o‘rganilgan. Indol hosilalaridagi o‘rinbosarlarning joylashish

holatiga qarab elektrofil reagentning hujumi 5- va 6- holatlarga yo‘nalgan bo‘lishi mumkin. Hosil bo‘ladigan mahsulotlarning unumi 75–85% ni tashkil qiladi. N-metilolftalimid bilan amidometillash reaksiyalarida sulfat kislotadan tashqari katalizatorlar sifatida fosfat, xlorid, triftorsirka kislotalar va turli xil organik erituchilardan (metanol, etanol, sirka kislota, xloroform va boshqa) foydalaniladi. Reaksiya sharoitiga qarab, mono-, di- almashgan amidoalkil mahsulotlar hosil bo‘ladi [9. B. 10].

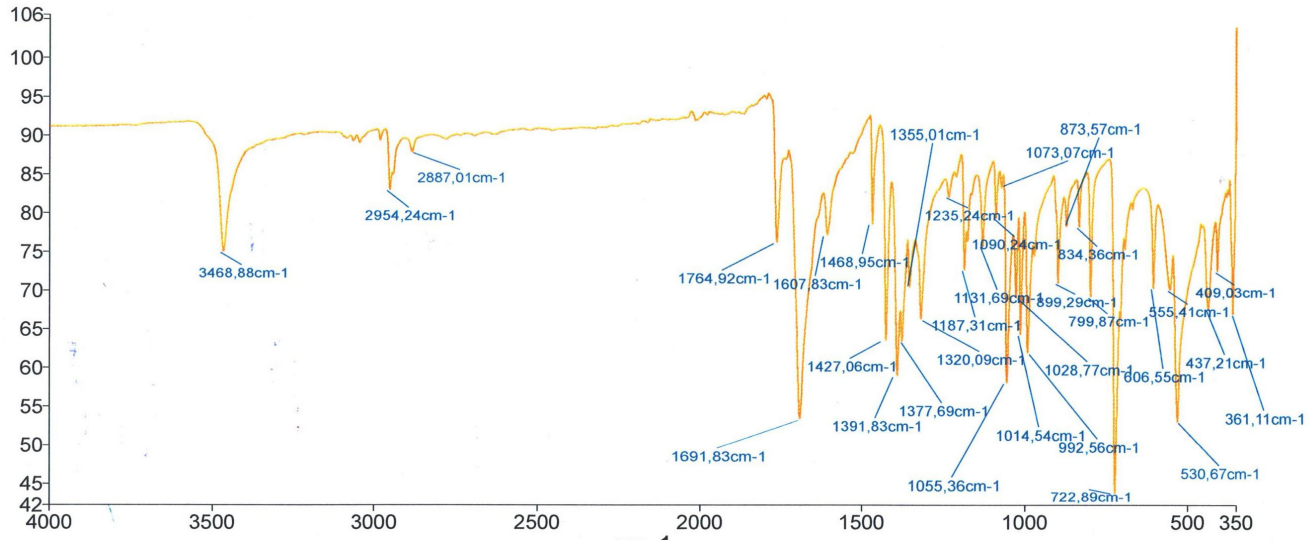
Kislotalarni gidroksialkilimidlar yordamida amidoalkillash reaksiyasi orqali turli xildagi biologik faollikka ega bo‘lgan efirlar olish va shu bilan bir qatorda, olinishi qiyin bo‘lgan murakkab tuzilishli geterosiklik birikmalarni hamda birlamchi aminlarni sintez qilish mumkin [10. B. 7440–7443].

Shu sababli kimyogar olimlarda ftalimid guruhi tutgan alifatik kislotalarining murakkab efirlarini sintez qilish va uning xossalarini o‘rganish alohida qiziqish uyg‘otadi. Biz ham palmitin kislotasi bilan N-β-gidroksietilftalimid, palmitin va itakon kislotalarining N-gidroksimetilftalimid bilan eterifikasiya reaksiyalarini olib bordik.

Tadqiqot usullari

Murakkab efirlar sintezida kislotalarni ftalimid guruhi tutgan N-gidroksimetilftalimid va N-gidroksietilftalimidlar bilan amidoalkillash reaksiyalaridan foydalanildi. Reaksiyalarning borishi va mahsulot tozaligi yupqa qatlam xromatografiyasida tekshirildi. Olingan yangi moddalarning tuzilishi IQ- va xromato-mass-spektroskopiya usullari yordamida tasdiqlandi.

Tajribalar uchun birlamchi spirtlar adabiyotlarda ma’lum usullar bo‘yicha sintez qilib olindi [11. B. 38–43]. N-gidroksimetilftalimid T_{suyuq}.=136-138^{0}C, Rf=0,52 (silufol sistema benzol:atseton=3:1). N-β-gidroksietilftalimid T_{suyuq}.=126-128^{0}C, R_f=0,33 (silufol, sistema benzol:atseton=3:1).



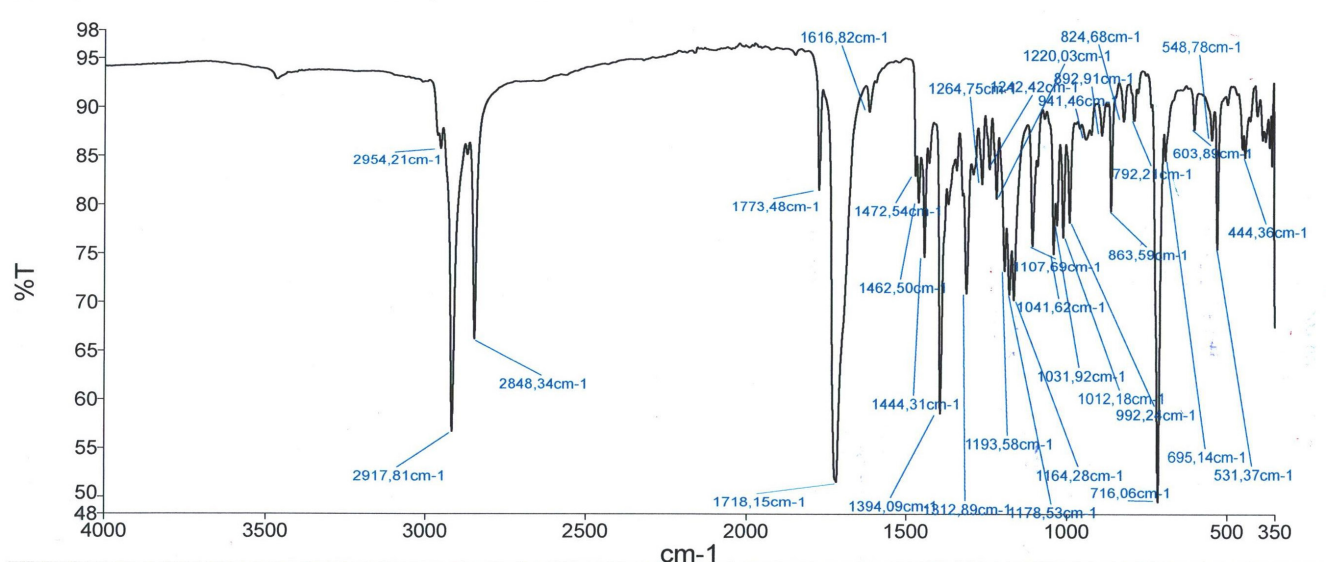
Etilolftalimining IQ-spektori.

Barcha reaksiyalarni shtativga o‘rnatilgan teskari sovutgich, suv yig‘gich va mexanik aralashtirgich bilan jihozlangan tubi yassi kolbada amalga oshirildi. Kolbaga N-gidroksimetilftalimid va karbon kislota (1:1,1 nisbatda) erituvchi sifatida benzol va katalizator sifatida sulfat kislota solindi. Reaksiyani magnitli aralashtirgichda 7–9 soat davomida (hisoblab topilgan miqdordagi suv ajralib chiqqunga qadar), 75–80^{0}C haroratda olib borildi. Suv ajralishi tugagandan so‘ng reaksiya aralashmasi sovitildi va distillangan suv ustiga quyildi. Aralashmadan tushgan cho‘kma filtirlab, ajratib olindi. Modda qayta kristallab tozalandi.

Palmitin kislotasining ftalimidoetilefiri – rangsiz kristal modda, mahsulot unumi 89%, suyuqlanish harorati T_{suyuq}.=54-55^{0}C, YUQXda R_f= 0.69 (silufol, sistema geksan-aseton 3:1).

Palmitin kislotasi ftalimidoetilefirining IQ-spektridagi o‘ziga xos yutilish sohalari (sm-1): 1,2-di-

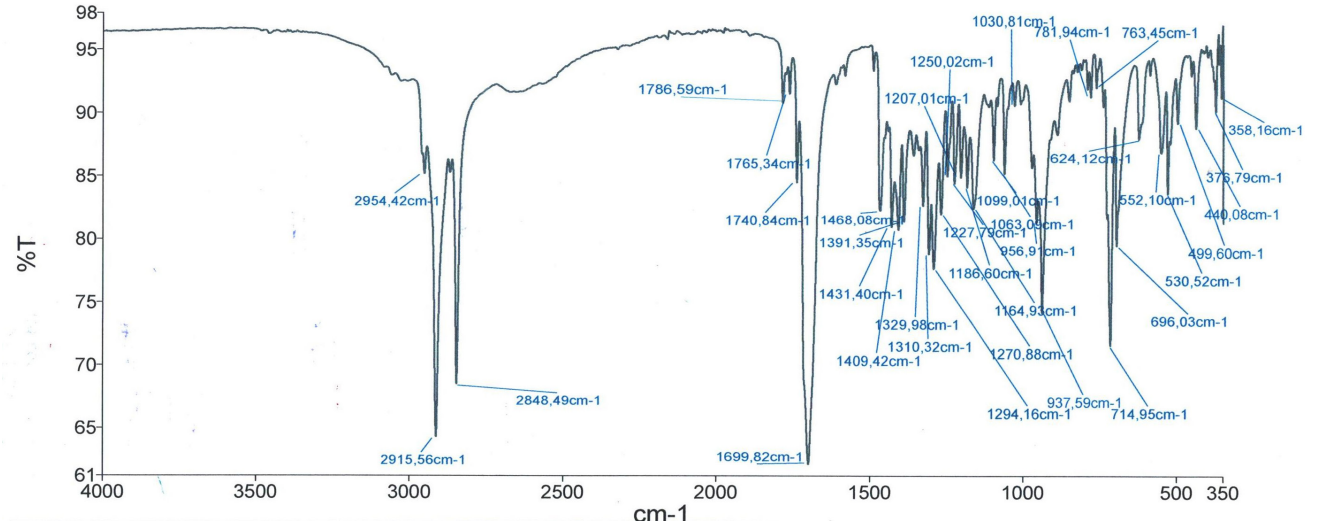
almashingan aromatik halqadagi CH bog‘ining deformatsion tebranishlari 716 da; aromatik halqadagi C=C bog‘ining valent tebranishlari 1394 da va -CO-NH- amid bog‘ining valent tebranishlari 1718 da; azotga bog‘langan CH_2 guruhining valent tebranishlari 1312 da va CH_2-COOR murakkab efir bog‘ining valent tebranishi 1773 da kuzatildi.



Palmitin kislotasi ftalimidoetilefirining IQ-spektori.

Palmitin kislotasining ftalimidometilefiri-oq kristal modda, mahsulot unumi 91%, suyuqlanish harorati T_{suyuq}=67-68^{0}C, YUQX da R_f=0,75 (silufol, sistema geksan-aseton 3:1).

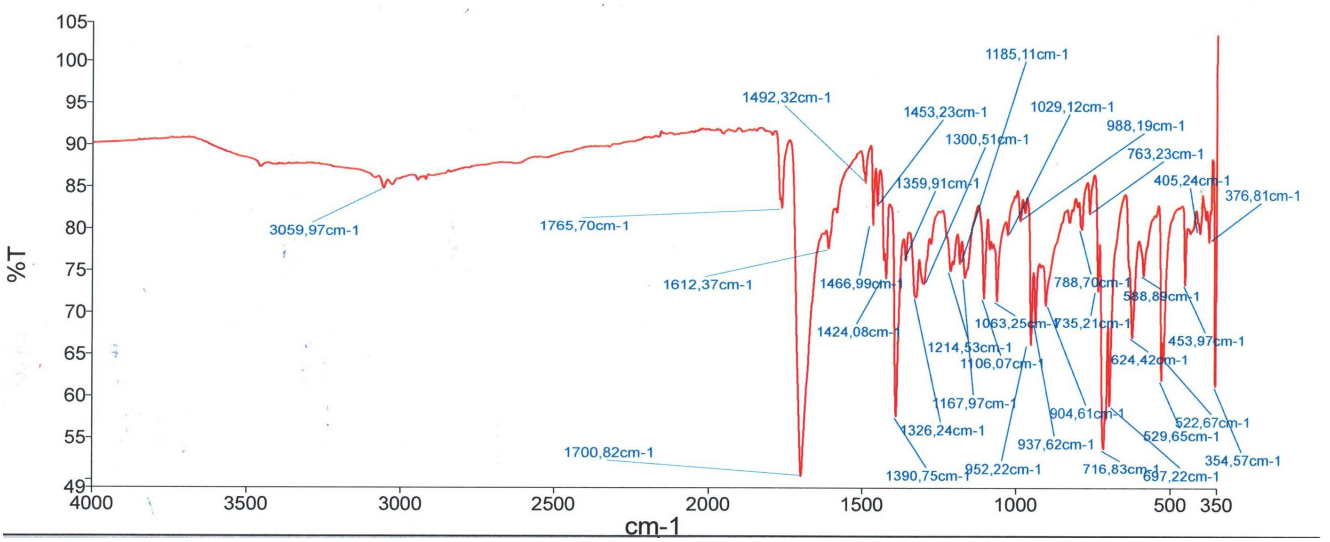
Palmitin kislotasi ftalimidometilefirining IQ-spektridagi o‘ziga xos yutilish sohalari (sm^{-1}): 1,2-dialmashingan aromatik halqadagi CH bog‘inning deformatsion tebranishlari 714 da; aromatik halqadagi C=C bog‘larning valent tebranishlari 1468 da, -CO-NH- amid guruhining assimetrik tebranishlari 1699, 1740 sohada; CH_2 guruhining assimmetrik valent tebranishi 2915 da, azotga bog‘langan CH_2 guruhining valent tebranishlari 1294, 1310 da; 1786, 1765 da -CH_2-COOR murakkab efir bog‘ining valent va 1294 da –C-O- bog‘ining valent tebranishlari kuzatildi.



Palmitin kislotasi ftalimidometilefirining IQ-spektori.

Itakon kislotasining ftalimidometilefiri – oq rangli kristal modda, mahsulot unumi 86%, suyuqlanish harorati T_{suyuq}.=106-107^{0}C, YUQX da R_f= 0.62 (silufol, sistema geksan-aseton 3:1).

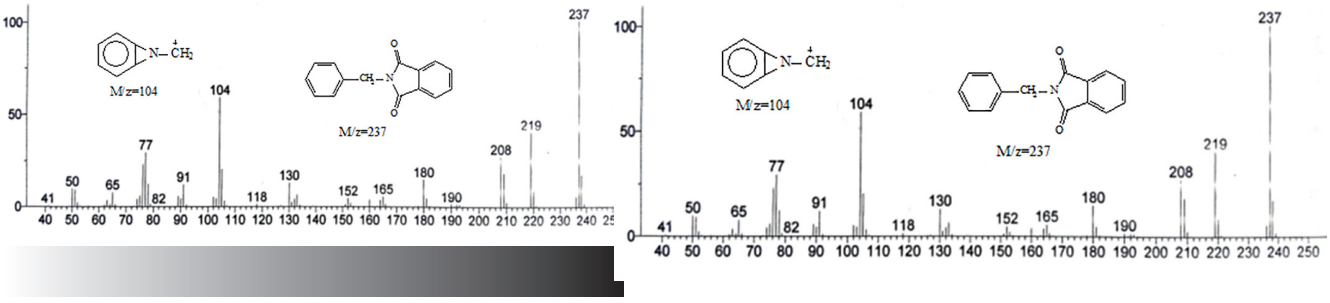
Itakon kislotasi ftalimidometilefirining IQ-spektridagi o‘ziga xos yutilish sohalari (sm^{-1}): 1,2-dialmashingan aromatik halqadagi CH bog‘inning deformatsion tebranishlari 716 da; aromatik halqadagi C=C bog‘larning valent tebranishlari 1390 da, -CO-NH- amid guruhining valent tebranishlari 1700 da; azotga bog‘langan CH_2 guruhining valent tebranishlari 1359 da; 1765 da -CH_2-COOR murakkab efir bog‘ining valent tebranishlari kuzatildi.



Itakon kislotasi ftalimidometilefirining IQ-spektori.

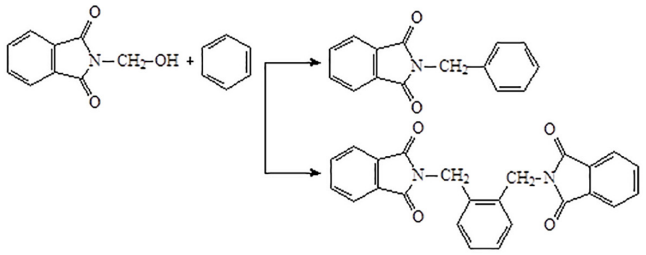
Modda nomi	Brutto formulasi	Suyuqlanish harorati ^{0}C da	R_f qiymati (Sistema geksan:atseton 3:1)
Palmitin kislotasi ftalimidometilefiri	$C_{25}H_{37}NO_4$	67-68	0,75
Palmitin kislotasining ftalimidoetilefiri	$C_{26}H_{39}NO_4$	54-55	0,69
Itakon kislotasining ftalimidometilefiri	$C_{14}H_{11}NO_6$	106-107	0,62

Olingan moddalar xromotomass spektroskopiya usuli bilan ham o‘rganildi. N-gidroksimetil-ftalimidning palmitin kislotasi o‘rtasida olib borilgan reaksiyadan olingan mahsulotning xromotomass spektroskopiya tahlili:

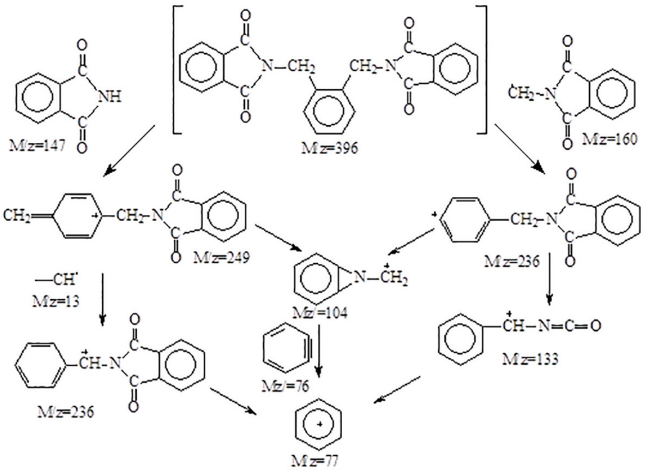


Palmitin kislotasi ftalimidometilefirining Xromotomass spektori.

Olingan natijalar shuni ko‘rsatdiki, N-gidroksimetilftalimid va palmitin kislota o‘rtasidagi reaksiyada kutilgan eterifikatsiya reaksiyasidan tashqari N-gidroksimetilftalimid reaksiyada erituvchi sifatida ishlatilayotgan benzol bilan 1:1 va 2:1 nisbatlarda reaksiyaga kirishgan va tegishli reaksiya mahsulotlari hosil bo‘lgan.

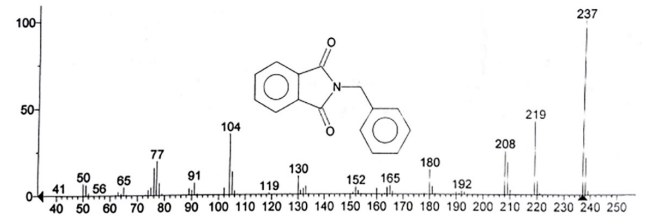


Reaksiya natijasida olingan mahsulotni xromotomass spektroskopiya tahlilini quyidagicha ko‘rsatish mumkin. Bu ko‘rinishdagi tahlilda olingan mahsulotning xromotomass spektroskopik tahlilida hosil qilgan barcha ionlarini ko‘rishimiz mumkin.

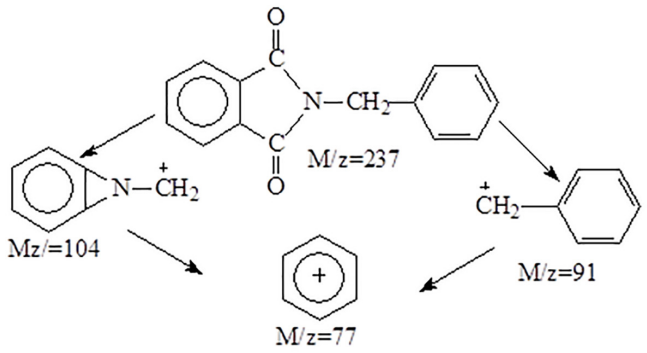


Palmitin kislotasi ftalimidometilefirining Xromotomass spektori tahlili.

N-gidroksimetilftalimid va itakon kislotasi o‘rtasidagi reaksiya mahsuloti ham xromotomass spektroskopiya usuli yordamida tahlil qilindi:



Itakon kislotasi ftalimidometilefirining Xromotomass spektori.



Itakon kislotasi ftalimidometilefirining Xromotomass spektori tahlili.

Xromotomass spektroskopiya tahlili shuni to‘rsatdiki, itakon kislota bilan N-gidroksimetilftalimid o‘rtasida olib borilgan reaksiya natijasida N-gidroksimetilftalimid va benzol o‘rtasida 1:1 nisbatda reaksiya mahsuloti hosil bo‘lgan.

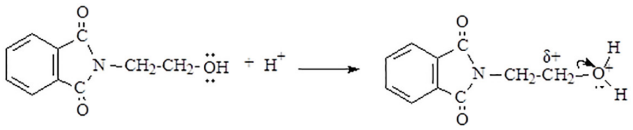
Natijalar va muhokama

Karbon kislota efirlarini olishda karbon kislotadagi o‘rinbosar tabiatining ahamiyati katta bo‘ladi. Agar o‘rinbosar elektronodonor xossaga ega bo‘lsa, karboksil guruhi uglerod atomidagi musbat zaryad qiymati kamayadi va O-nukleofil almashinish qiyinlashadi. Bizga ma’lumki, monoxlorsirka kislota sirka kislotaga nisbatan oson reaksiyaga kirishadi. Bunga sabab sirka kislotasidagi bitta vodorod xlorga almashinganda karboksil guruhidagi uglerodning musbat zaryadining qiymati va kislotaligi ortishidir:

sirka pKa= 4.76, propion pKa= 4.88,
kapril pKa= 4.88, adipin 1) pKa= 4.42, 2) pKa= 5.28,
xlorsirka pKa= 2.86, bromsirka pKa= 2.86,
dixlorsirka pKa= 1,29, trixlorsirka pKa= 0.65,
triftorsirka pKa= 0,23, tribromsirka pKa= 0.66.

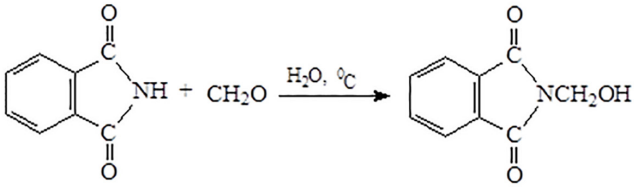
Natijada amidoalkillovchi reagentning kirib kelishi osonlashadi. Demak, kuchli akseptor xossali atomlar tutgan sirka kislotasida boshqa gamologlariga nisbatan O-nukleofil almashinish oson boradi va mahsulot unumi yuqori bo‘ladi. Efir hosil bo‘lishi qaytar bo‘lganligi sababli, muvozanatning o‘ng tomonga siljishiga reaksiya muhitidan suvning chiqarilib yuborilishi ham ahamiyatli bo‘ladi.

Amidoalkillovchi reagent N-β-gidroksietilftalimid ham birlamchi spirtlar kabi ko‘p miqdorda olingan katalizator yoki protonli erituvchilar ta’sirida oksoniy kompleks ioni hosil qilishi va nukleofillik xossasi kamayishi mumkin:



Demak, nukleofil almashinish reaksiyasi uchun aproton erituvchilar yoki suvni azeotrop aralashma holida olib chiqib ketadigan erituvchilardan foydalanish mumkin.

Biz sintez qilib olgan N-gidroksimetilftalimid:



N-β-Gidroksietilftalimid bilan amidoalkillash reaksiyalarida erituvchi sifatida benzolni qo‘llash yaxshi natija beradi. Monoxlor sirka kislotasi ftalimidoetil efirini sintez qilish β-atsetoksietilftalimidning sintez qilish reaksiyasi sharoitida olib borilganda murakkab efir 84% unum bilan hosil bo‘ladi. Agar reaksiya natijasida hosil bo‘ladigan suvni benzol yordamida reaksiya muhitidan chiqarib yuborilsa mahsulot 98% unum bilan hosil bo‘lishi aniqlangan. Reaksiya uchun monoyod sirka kislota olinganda hosil bo‘ladigan murakkab efir unumi 82%, triftor sirka kislotaning ftalimidoetil efiri unumi esa 83% ni tashkil qiladi [11. B. 38].

N-metilolftalimid metilen guruhi elektronlarining ikkita karbonil guruhlariga tortilishi natijasida uglerod-kislorod bog‘i zaiflashadi va O-nukleofillik xossasi kamayadi. Natijada N-metilolftalimid birlamchi spirt kabi emas, balki uchlamchi spirt singari reaksiyaga kirishgan deb taxmin qilish mumkin. Shu sababli sinxron bimolekulyar almashinish uchun tanlangan sharoitda palmitin va itakon kislotalarini N-metilolftalimid bilan amidoalkillash reaksiya mahsulot unumi bir muncha past bo‘lgan. Efirlarning hosil bo‘lishi esa sirka kislota hosillarining kislotalik xossasiga bog‘liq bo‘lmagan deb qarash mumkin.

Xulosa

N-gidroksimetilftalimidlar bilan karbon kislotalarini amidoalkillash reaksiyalari natijasida palmitin va itakon kislotasining ftalimidoalkil efirlari sintez qilindi. Sintez qilingan murakkab efirlarning unumi eterifikatsiya reaksiyasi uchun olingan reagentlar va erituvchining tabiatiga ko‘ra hosil bo‘lganligi ko‘rsatildi. Shuningdek, N-gidroksimetilftalimid birlamchi spirt bo‘lishiga qaramasdan karbon kislotalari bilan benzol erituvchisida boradigan reaksiyalarida uchlamchi spirtlar kabi reaksiyaga kirishishi ko‘rsatib berildi.

REACTIONS OF PALMITIN AND ITACONIC ACIDS WITH N-HYDROGICAL PHYTALYMIDES

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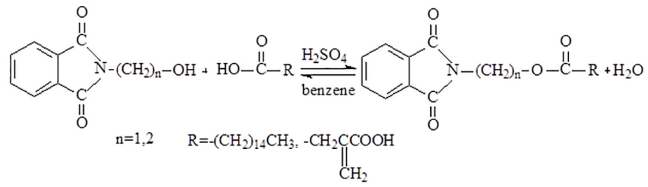
Keywords: N-hydroxymethylphthalimide, N-hydroxyethylphthalimide, palmitic acid, itaconic acid, amidoalkylation, ester.

N-hydroxymethylphthalimide and N-hydroxyethylphthalein phylmethylides of N-hydroxymethylphthalimide and N-hydroxyethylphthalate complex, which belong to the phthalimide group, in order to obtain esters of various biological activity by the amidoalkylation reaction of acids with hy-

droxyalkylimides, as well as to synthesize complex heterocyclic compounds that are difficult to obtain we carried out esterification reactions to synthesize. The course of the reactions and the purity of the product were checked on thin-layer chromatography. The structure of the obtained new substances was determined using IR-spectroscopy, chromato-mass-spectrometry methods.

Primary alcohol for the experiments was synthesized by known methods in the literature. We performed all the reactions in a round tube with a reverse cooler mounted on a tripod, a water collector and a mechanical stirrer. A small amount of N- (hydroxymethylphthalimide and carbonic acid (1: 1.1 ratio) benzene as a solvent and a small amount of sulfuric acid as a catalyst was added to the flask. After the water separation was completed, the reaction mixture was cooled and poured over the water. The precipitate from the mixture was filtered and separated. The substance was recrystallized.

As a result of the attraction of electrons of the methylene group N-methylphthalelimide to the two carbonyl groups, the carbon-oxygen bond is weakened and the O-nucleophilic properties are reduced. As a result, it can be assumed that N-methylphthalimide reacts not as a primary alcohol but as a tertiary alcohol. Therefore, the product yield of the amidoalkylation reaction of palmitic and itaconic acids with N-methylphthalimide was slightly lower under the conditions selected for synchronous bimolecular exchange. The formation of esters can be considered as independent of the acidity of the acid.



As a result of amidoalkylation reactions of palmitic and itaconic acids with N-hydroxyalkylphthalimides, phthalimidoalkyl esters of these acids were synthesized. It was shown that the yield of the synthesized esters was formed according to the nature of the reagents and solvent obtained for the esterification reaction. It has also been shown that N-hydroxymethylphthalimide reacts with carbonic acids as a tertiary alcohol in its reactions with benzene solvent, despite being a primary alcohol.

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