CHEMISTRY AND CHEMICAL ENGINEERING

Volume 2024 | Number 1 Article 8

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Muyassar K. SALIEVA
Chirchik State Pedagogical University, Chirchik, Uzbekistan, muyassar.saliyeva@mail.ru

Odiljon E. ZIYADULLAYEV
Chirchik State Pedagogical University, Chirchik, Uzbekistan; Academy of the Ministry of Emergency Situations, Tashkent, Uzbekistan, bulak2000@yandex.ru

Guzal K. OTAMUKHAMEDOVA
Chirchik State Pedagogical Institute, Chirchik, Uzbekistan, guzal020003@yandex.ru

Rifkat F. TALIPOV
Ufa University of Science and Technology, Ufa, Russia, talipov@mail.ru

Lochin K. ABLAKULOV
Chirchik State Pedagogical University, Chirchik, Uzbekistan, monokop91@mail.com

Recommended Citation

SALIEVA, Muyassar K.; ZIYADULLAYEV, Odiljon E.; OTAMUKHAMEDOVA, Guzal K.; TALIPOV, Rifkat F.; and ABLAKULOV, Lochin K. () "SYNTHESIS OF ACETYLENE DIOLS WITH THE PARTICIPATION OF THE Bu4NOH/DMSO/H2O CATALYTIC SYSTEMS," *CHEMISTRY AND CHEMICAL ENGINEERING*: Vol. 2024: No. 1, Article 8.
DOI: 10.34920/cce202418
Available at: https://cce.researchcommons.org/journal/vol2024/iss1/8

SYNTHESIS OF ACETYLENE DIOLS WITH THE PARTICIPATION OF THE $Bu_4NOH/DMSO/H_2O$ CATALYTIC SYSTEMS

Muyassar K. SALIEVA[1] (muyassar.saliyeva@mail.ru),
Odiljon E. ZIYADULLAEV[1,2] ((bulak2000@yandex.ru),
Guzal K. OTAMUKHAMEDOVA[1] (guzal020003@yandex.ru),
Rifkat F. TALIPOV[3] (talipov@mail.ru),
Lochin K. ABLAKULOV[1] (monokop91@mail.com)
[1]Chirchik State Pedagogical University, Chirchik, Uzbekistan
[2]Academy of the Ministry of Emergency Situations, Tashkent, Uzbekistan
[3]Ufa University of Science and Technology, Ufa, Russia

The purpose of this work in this study, acetylene alcohols containing heteroatomic substituents in their molecular composition- 2-(-thiophen-2-yl)but-3-yn-2-ol, 2-(3-methylthiophen-2-yl)but-3-yn-2-ol, 2-(furan-2-yl)but-3yn-2-ol, 2-(pyridin-4-yl)but-3-yn-2-ol, 2-(5-chlorothiophen-2-yl)but-3-yn-2-ol, 2-(5-bromothiophen-2yl)but-3-yn-2-ol acetylene diols were synthesized based on the reaction with acetone in a dimethyl sulfoxide solvent in the presence of the $Bu_4NOH/DMSO/H_2O$ catalytic system. The influence of the molar ratio of starting materials, reaction duration, temperature, nature of the catalyst and solvents on the product yield was systematically studied. The composition, purity and structure of the new generation of synthesized acetylenediols have been confirmed by modern physicochemical methods. The mechanism of the reaction process has been developed.

Keywords: acetylene alcohols, acetone, dimethylsulfoxide, reaction mechanism

СИНТЕЗ АЦЕТИЛЕН ДИОЛОВ С УЧАСТИЕМ КАТАЛИТИЧЕСКОЙ СИСТЕМЫ $Bu_4NOH/DMSO/H_2O$

Муяссар К. САЛИЕВА[1] (muyassar.saliyeva@mail.ru),
Одилжон Э. ЗИЯДУЛЛАЕВ[1,2] (bulak2000@yandex.ru),
Гузал К. ОТАМУХАМЕДОВА[1] (guzal020003@yandex.ru),
Рифкат Ф. ТАЛИПОВ[3] (talipov@mail.ru),
Лочин К. АБЛАКУЛОВ[1] (monokop91@mail.com)
[1]Чирчикский государственный педагогический университет, Чирчик, Узбекистан
[2]Академия министерства чрезвычайных ситуаций, Ташкет, Узбекситан
[3]Уфимский университет науки и технологий, Уфа, Россия

Цель работы – исследование ацетиленовых спиртов, содержащих в молекулярном составе гетероатомные заместители –2-(тиофенил-2)бутин-3-ол-2, 2-(3-метилтиофенил-2)бутин-3-ол-2, 2-(фуранил-2)бутин-3-ол-2, 2-(пиридинил-4)бутин-3-ол-2, 2-(5 -хлортиофенил-2)бутин-3-ол-2, 2-(5-бромтиофенил-2)бутин-3ол-2 ацетилен диолы синтезированых на основе реакции с ацетоном в диметилсульфоксидном растворителе в присутствии каталитической системы $Bu_4NOH/DMSO/H_2O$. Изучалось влияние мольного соотношения исходных веществ, продолжительности реакции, температуры, природы катализатора и растворителей на выход продукта. Состав, чистота и строение синтезированных ацетилендиолов нового поколения подтверждены современными физико-химическими методами. Представлен механизм процесса реакции.

Ключевые слова: ацетиленовые спирты, ацетон, диметилсульфоксид, механизм реакции

$Bu_4NOH/DMSO/H_2O$ KATALITIK SISTEMASI ISHTIROKIDA ATSETILEN DIOLLARI SINTEZI

Muyassar K. SALIYEVA[1] (muyassar.saliyeva@mail.ru),
Odiljon E. ZIYADULLAYEV[1,2] (bulak2000@yandex.ru),
Go‘zal K. OTAMUXAMEDOVA[1] (guzal020003@yandex.ru),
Rifkat F. TALIPOV[3] (talipov@mail.ru),
Lochin K. ABLAKULOV[1] (monokop91@mail.com)
[1]Chirchiq davlat pedagogika universiteti, Chirchiq, O‘zbekiston
[2]Favqulodda vaziyatlar vazirligi Akademiyasi, Toshkent, O‘zbekiston
[3]Ufa fan va texnologiyalar universiteti, Ufa, Rossiya

Ushbu tadqiqot ishining maqsadi molekulasi tarkibida geteroatom o‘rinbosarlar saqlagan atsetilen spirtlari- 2-(tiofenil-2)butin-3-ol-2, 2-(3-metiltiofenil-2)butin-3-ol-2, 2-(furanil-2)butin-3-ol-2, 2-(piridinil-4)butin-3-ol-2, 2-(5-xlortiofenil-2)butin-3-ol-2, 2-(5-bromtiofenil-2)butin-3ol-2 ni $Bu_4NOH/DMSO/H_2O$ katalitik sistemasi ishtirokida erituvchi dimetilsulfoksidda atseton bilan reaksiyalari asosida atsetilen diollari sintez qilingan. Mahsulot unumiga boshlang‘ich moddalar mol miqdori nisbatlari, reaksiya davomiyligi, harorat, katalizator va erituvchilar tabiati ta’siri tizimli ravishda o‘rganilgan. Sintez qilingan yangi avlod atsetilen diollarining tarkibi, tozaligi va tuzilishi zamonaviy fizik-kimyoviy usullarda isbotlangan. Reaksiya jarayonining mexanizmi ishlab chiqilgan. Sintez qilingan atsetilen spirtlarining element tahlili amalga oshirilgan.

Kalit so'zlar: atsetilen spirtlari, atseton, dimetilsulfoksid, reaksiya mexanizmi

DOI: 10.34920/cce202418

Kirish

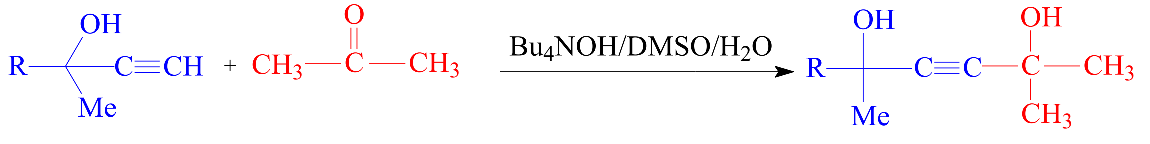
Atsetilen spirtlari va ularning diollari organik sintezda muhim reagent hisoblanib, bugungi kunda tibbiyotda antibiotiklar, vitaminlar, pigmentlar, va garmonlar ishlab chiqarishda qo‘shimcha komponentlar sifatida keng foydalanilmoqda [1-3]. Atsetilen diollarini yuqori unumlarda sintez qilish uchun alkinlarni nBuLi/Et_2O katalitik sistemasida, -78 ^{o}C haroratda, 2 soat davomida aldegidlar bilan reaksiyasi natijasida alkin-1,4-diollar sintezi amalga oshirilgan [4]. Atsetilen spirtlari alkinil digalogenid hosilalarining butillitiy yoki litiy naftalenni tetragidrofurandagi eritmasida va benzaldegid bilan ta'sirlashishidan yuqori selektivlik bilan asimmetrik atsetilen diollari sintez qilingan [5]. Yue-Qing Gu,a Peng-Peng Zhang hamda uning hamkasblari tomonidan alkindiollarning oltin (I)-katalizatori ishtirokida sikloizomerizatsiya reaksiyalari olib borilgan va 7-oksabisiklo[2.2.1] geptan hamda farnesiferol C ning assimetrik umumiy sintezi amalga oshirilgan [6]. Kalsiy karbidning ketonlar bilan enantioselektiv birikish reaksiyalarida atsetilen spirtlari bilan birgalikda qoʻshimcha mahsulot sifatida atsetilen diollari ham hosil boʻlishi aniqlangan [7]. Formaldegidning mis (I) tuzlari katalizatori ishtirokida atsetilen va uning gomologlari bilan alkinillanishi natijasida atsetilen diollari sintez qilingan, erituvchi tetragidrofurandan foydalanilgan [8]. Kalsiy karbidning ketonlar bilan enantioselektiv birikish reaksiyalari asosida atsetilen spirtlari va qoʻshimcha mahsulot sifatida atsetilen diollari ham hosil boʻlishi aniqlangan [9]. Shuningdek, tetragidrofuran eritmasida, mis (I) tuzlari katalizatori ishtirokida atsetilen va uning gomologlari bilan formaldegidning alkinillanishi natijasida atsetilen diollari sintez qilingan [10-11]. Atsetilen diollarini sintez qilish uchun atsetilen spirtlarini 2 ekvivalent n-butillitiy bilan elektrofil birikish reaksiyasi asosida hosil boʻlgan bislitiyalkogolyatga seriy (III) xlorid ishtirokida propilen oksid bilan reaksiyasidan foydalanilgan [12]. Tetra-n-butilammoniy gidroksid va dimetilsulfoksid asosida tayyorlangan yuqori asosli katalitik sistema yordamida 1-etinilsiklogeksanolning alifatik, aromatik va alisiklik ketonlarni terminal atsetilen spirtlari bilan nukleofil reaksiyasi asosida yuqori unum bilan atsetilen diollari sintez qilingan [13]. Atsetilen spirtlari ikki ekvivalent n-butil litiy bilan birikishi natijasida bis-litiy tuzlari sintez qilinib, NH_4Cl ishtirokida ularning reaktivligi tegishli elektrofillar sifatida aldegidlar, ketonlar bilan reaksiyaga kirishish yoʻli bilan atsetilen diollari - 2 -geksin-1,4-diol sintez qilingan va saratonga qarshi preparatlarning analoglari sifatida ishlatilgan [14]. Shuningdek, galogen alknilar ishtirokida tetradeka-5,7-diyn-4,9-diol va 2-metiltetradeka-5,7-diin-4,9-diollar sintez qilingan va saraton kasalligiga qarshi eng yaxshi kimyoterapevtik faolligi jihatidan sulforafan bilan tengligi isbotlangan [15]. Shuningdek, Roberto Sans Diez, Brian Adgerc and Erick M. Carreira olimlar tomonidan $Zn(OTf)_2$/Et_2O/(+)-N-metilefidren ishtirokida 99% 1-alkin-2-1,4-diol sintez qilingan va bir qator biologik xossalari oʻrganilgan [16]. Atsetlen diollarini KOH katalitik sistema ishtirokida 1-geksin-ol-3 asosida butiraldegid bilan nukleofil birilikishi natijasida detsin-5-diol-4,7 sintezi amalga oshirilgan [17-18]. Ushbu usul bilan molekulasi tarkibida geteroatom saqlagan atsetilen spirtlari-2-(tiofenil-2)butin-3-ol-2, 2-(3-metiltiofenil-2)butin-3-ol-2, 2-(furanil-2)butin-3-ol-2, 2-(piridinil-4)butin-3-ol-2, 2-(5-xlortiofenil-2)butin-3-ol-2, 2-(5-bromtiofenil-2)butin-3ol-2 ni $Bu_4NOH/DMSO/H_2O$ katalitik sistemasi ishtirokida atseton bilan nukleofil birikish reaksiyasi asosida quyidagi atsetilin diollari-2-metil-5-((tiofenil-2) geksin-3-diol-2,5 (1), 2-metil-5-(3-metiltiofenil-2) geksin-diol-2,5 (2), 2-(furanil-2)-5-metilgeksin-3-diol-2,5 (3), 2-metil-5-piridinil-4)geksin-3-diol-2,5 (4), 2-(5-xlortiofenil-2)-5-metilgeksin-3-diol-2,5 (5), 2-5-(bromtiofenil-2)-5-metilgeksin-3-diol-2,5 (6) ning sintezi amalga oshirildi**.**

Tadqiqot usullari

$Bu_4NOH/DMSO/H_2O$ katalitik sistemasida atsetilen diollarini sintezi qilish usuli. (*Na'muna sifatida 2-(furanil-2)-5-metilgeksin-3-diol-2,5 sintezi keltirilgan.*) Reaksiya mexanik aralashtirgich (SPXFLOW Lightnin LB2, 20/150/2500 rpm markali), tomizgich voronka (IsoLab TS29/32, markali, hajmi 200 ml) qaytarma sovutgich (Dimrota TS29/32, 160 mm. markali), shlifli termometr (Thermometer LLG-General -10/+250 ^oC markali) oʻrnatilgan maxsus tayyorlangan ikki qavatli, hajmi 5000 ml boʻlgan reaktorda amalga oshirildi.

Dastlab jarayon 259 g (1 mol) Bu_4NOH (40 % suvli eritmasi) va 300 ml DMSO bilan harorat 7 ^oC, 60 minut davomida aralashtirilib, suspenziya hosil qilindi. Hosil boʻlgan katalitik sistemaga 136 g (1 mol) 2-(furanil-2)butin-3-ol-2 solindi hamda atsetilen spirti va jarayonda hosil boʻladigan atsetilen diollar polimerlanib ketmasligi uchun sistemaga gidroxinon qoʻshildi. Soʻngra 58 g (1 mol) atseton 60 minut davomida aralashtirilgan holatda tomchilatib qoʻshildi va 40 minut davomida aralashtirildi, shundan soʻng, jarayon 12 soat davomida tindirildi. Reaksion aralashma sovuq suv bilan (1:1) suyultirildi va dietil efir yordamida 3 marta (3×50 ml) ekstraksiya qilindi va suv (3×100 ml) bilan yuvildi, qurituvchi Na_2SO_4 yordamida 2 soat davomida quritildi. Mahsulot filtrlab olinib, vakuumli bugʻlatgich (Germaniyada ishlab chiqarilgan Hei–VAP Core HL/G3 markali) yordamida erituvchilar bug‘latildi, so‘ngra silikagel 60 xromatografiya kolonkasi orqali elyuent (geksan/etilatsetat) lardan o‘tkazilib, fraksiyalar yupqa qatlamli xromatografiya “Merck 60 F_{254}” plastinkasida R_f qiymatlari aniqlandi. Bunda 178,4 g 2-(furanil-2)-5-metilgeksin-3-diol-2,5 92 %, oraliq mahsulot 3%, boshlang‘ich moddalar 2% va qo‘shimcha mahsulotlar 3% unum bilan sintez qilishga erishildi.

Reaksiya ximizmi va mexanizmi. Molekulasi tarkibida geteroatom saqlagan atsetilen spirtlarining $Bu_4NOH/DMSO/H_2O$ katalitik sistemasi ishtirokida atseton bilan nukleofil birikish reaksiyasi mexanizmi adabiyot manbalari asosida quyidagicha taklif etildi [19].



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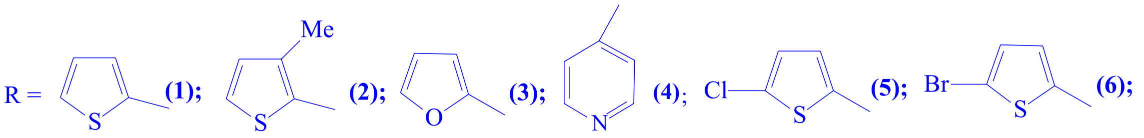
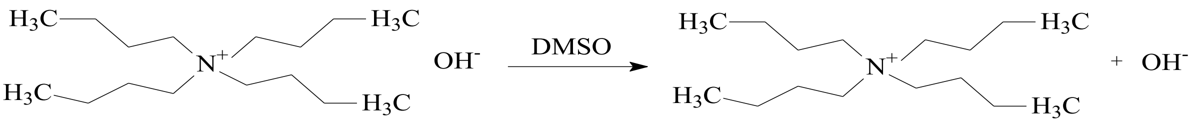
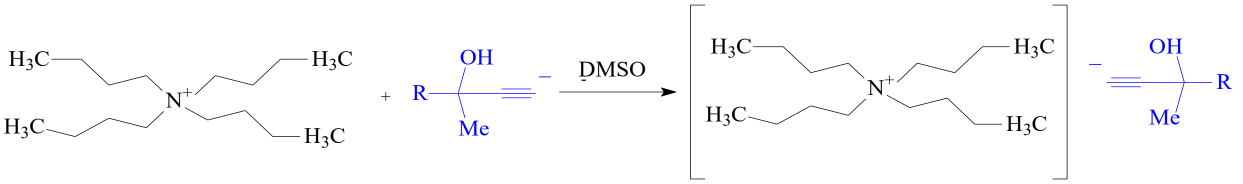


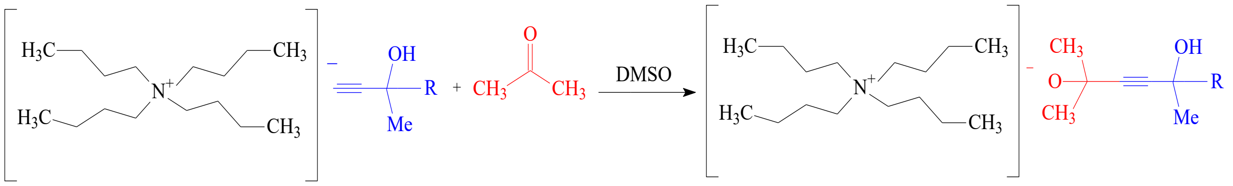
Dastlab jarayonda katalizator sifatida ishlatilgan Bu_4NOH aproton erituvchi dimetilsulfoksid ta’siri ostida Bu_4NOH ionlarga ajraladi [20].



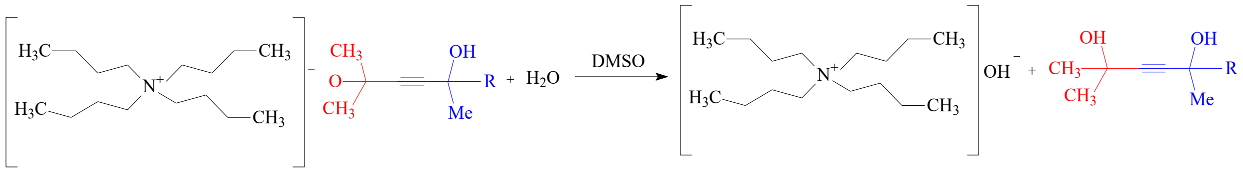
Natijada gidroksid anioni sp-s bog‘iga ta’sir qilib, atsetilen spirtining uch bog‘ining deprotonlanishiga sabab bo‘ladi. Hosil bo‘lgan nukleofil ioni esa tetra-n-butilammoniy kationi bilan faol oraliq mahsulot hosil qiladi.



Reaksiyaning keyingi bosqichida, hosil bo‘lgan oraliq mahsulotga ohistalik bilan keton qo‘shiladi. So‘ng keton tarkibidagi karbonil guruhi hosil bo‘lgan atsetilenid ionining nukleofil hujumiga uchrab, atsetilen spirtining kislorod markazlashgan anioni bilan birikib, tetra-n-butilammoniy kationi bilan oraliq mahsulot hosil qiladi.

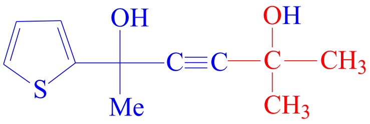


So‘ngra, reaksiya natijasida hosil bo‘lgan oraliq mahsulot gidrolizga uchrashi natijasida atsetilen diollari hosil bo‘ladi.



Natijalar va muhokama

Usgbu usul bilan tarkibida geteroatom saqlagan atsetilen spirtlari- 2-(tiofenil-2)butin-3-ol-2, 2-(3-metiltiofenil-2)butin-3-ol-2, 2-(furanil-2)butin-3-ol-2, 2-(piridinil-4)butin-3-ol-2, 2-(5-xlortiofenil-2) butin-3-ol-2, 2-(5-bromtiofenil-2)butin-3ol-2 ni atseton bilan asosli muhitda olib borilgan jarayon natijasida quyidagi atsetilen diollari sintez qilindi.



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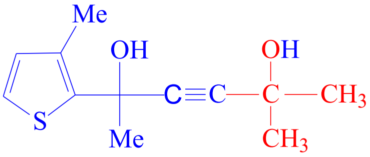

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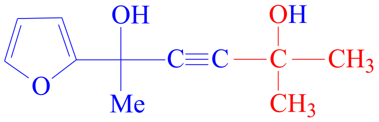

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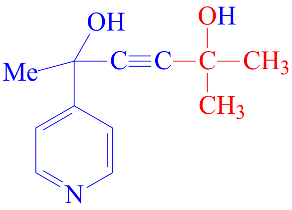

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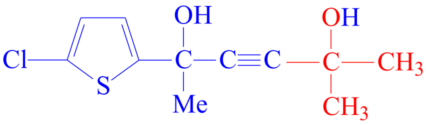

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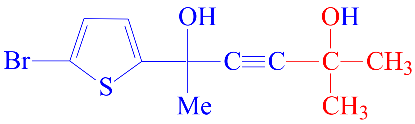

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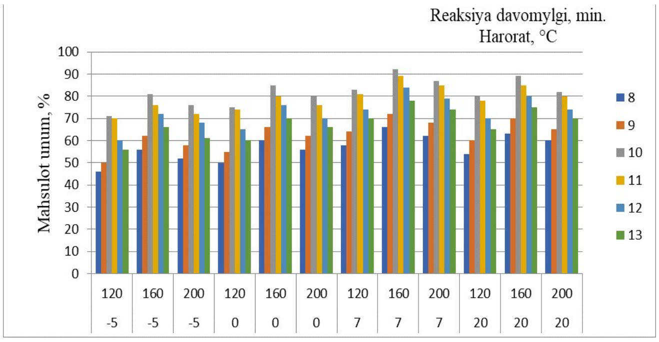
Ushbu jarayon uchun katalizatorning boshlang‘ich moddalar massasiga nisbatan olingan mol miqdori ta’siri, reaksiyaning borishi va uning bosqichlari, mahsulot unumiga erituvchi, katalizator, harorat, reaksiya davomiyligi kabi omillarning ta’siri o‘rganildi.

Dastlab atsetilen diollari sintezi unumiga harorat va reaksiya davomiyligi ta’siri o‘rganildi (1 -Rasm).



1-Rasm. Atsetilen diollari unumiga harorat va reaksiya davomiyligi ta’siri (boshlang‘ich moddalar va katalizator mol miqdorlari ekvimolyar nisbatda, erituvchi dimetilsulfoksid).

Rasmdan ko‘rinib turibdiki, reaksiya -5 ^{o}C÷20 ^{o}C harorat oraliqlarida olib borildi. Reaksiya -5 ^{o}C haroratda olib borilganda katalizatorning eruvchanligi va faolligi juda past namoyon qilganligi kuzatildi. Jarayonning haroratini 7 ^{o}C ga oshirilganda mahsulot unumi yuqori bo‘lgani aniqlandi. Mahsulot unumini oshirish maqsadida harorat 7- 20 ^{o}C gacha ko‘tarilganda sistemada reaksiyaning faollanish energiyasi ortishi hisobiga qaytar jarayonning ro‘y berishi orqali asosiy mahsulot unumining pasayishiga sabab bo‘ldi. Reaksiya jarayoni boshlang‘ich moddalar va katalitik sistema mol miqdorlari 1:1:1 mol nisbatlarda, erituvchi dimetilsulfoksid, harorat 7 ^{o}C, reaksiya davomiyligi 160 minut davomida olib borilganda, to‘qnashayotgan zarrachalarning energiyasi faollanish energiyasiga tenglashib molekulalardagi bog‘lar uzulib, yangi atsetilen spirtlari va ketonlar o‘rtasidagi C-C bog‘lar hosil qilish jarayoni kuzatilib, atsetilen diollari unumdorligi 8-66%, 9-72%, 10-92%, 11-89%, 12-84%, 13-78% yuqori bo‘lganligi kuzatildi.

Mazkur sistemada harorat bilan birgalikda atsetilen diollarining eng yuqori unumda chiqishi uchun reaksiya davomiyligi omili ham tadqiq qilindi (1-rasm).

Tanlangan atsetilen spirtlari va atseton reaksiyasi dastlab 120 daqiqa davomida amalga oshirildi Bu vaqt oralig‘ida boshlang‘ich moddalar to‘liq reaksiyaga kirisha olmaganligi va aralashmada qolib ketishi natijasida mahsulot unumining past chiqishi kuzatildi. Reaksiya davomiyligi 160 daqiqaga uzaytirilganda atsetilen diollarilarining unumdorligi oshishiga sistemaga reagent (atsetilen spirti) va substrat (ketont) ning deyarli to‘liq reaksiyaga kirishganligi sabab bo‘ldi va mahsulot unumiga ijobiy ta’sir ko‘rsatdi. Biroq reaksiya davomiyligi 200 daqiqaga yetkazilganda atsetilen diollarining unumi keskin kamayib ketdi va bunga turli reaksion holatlar sabab bo‘ldi. Ya’ni, reaksiya davomiyligi oshirilganda, sistemada hosil bo‘lgan atsetilen diollari molekulasidan suv ajralib chiqishi natijasida sistemada qo‘shimcha mahsulotlar, jumladan alkogolyatlar, poliatsetilen spirtlar, ketonlar, vinil efirlar, smolasimon va polimer mahsulotlar hosil bo‘lishi natijasida atsetilen diollari unumi 8- 66%, 9- 72%, 10- 92%, 11- 89%, 12- 84%, 13- 78% ga kamayishi kuzatildi.

Atsetilen diollarini sintez qilishda erituvchi tabiati ta’sirini o‘rganish maqsadida apraton erituvchilar dimetilformamid va dimetilsulfoksiddan foydalanildi (1-Jadval). Dimetilformamid qaynash harorati dimetilsulfksidga nisbatan past bo‘lgan aprotik erituvchidir. U S_N2 reaksiyalari kabi qutb mexanizmi bilan reaksiyalarni rag'batlantiradi. Lekin xossasi jihatidan kuchli kislotalar va asoslarga nisbatan barqaror bo‘lmaganligi hamda dimetilsulfoksidga nisbatan dielektrik o‘tkazuvchanligi (36,71 ga teng) pastligi tufayli ionlar bilan to‘qnashishlar sonini pasayishiga olib keldi, natijada atsetilen hosilalarining eruvchanligi dimetilsulfoksidga nisbatan past bo‘lishi kuzatildi.

Jarayon aproton erituvchi dimetilsulfoksidda olib borilganida mahsulot unumi yuqori chiqqanligi kuzatildi. Erituvchi dimetilsulfoksidning qaynash va dielektrik o‘tkazuvchanligi dimetilformamidga nisbatan yuqori bo‘lganligi mahsulot unumining ortishiga sabab bo‘ldi.

Olingan natijalar asosida atsetilen diollarini $Bu_4NOH/DMSO/H_2O$ katalitik sistemasida sintez qilish reaksiyalarining eng muqobil sharoitlari aniqlangan. Unga ko‘ra atsetilen spirtlarini keton bilan nukleofil reaksiyalari uchun harorat 7 ^{o}C, reaksiya davomiyligi 160 minut, boshlang‘ich moddalar reagent (atsetilen spirti) va substrat (keton) ning mol nisbatlari ekvimolyar nisbatda olingan holatda atsetilen diollari eng yuqori (**8**-66%, **9**-72%, **10**-92%, **11**-89%, **12**-84%, **13**-78%) unum bilan sintez qilindi.

Tadqiqot obyekti sifatida tanlangan atsetilen spirtlarining atseton bilan reaksiyasida boshlang‘ich moddalarning tarkibidagi o‘rinbosarlarining ta’siri nazariy tahlil qilindi va atsetilen diollari hosil bo’lish unumiga atsetilen spirtlarining samaradorlik qatori quyidagicha 2-(tiofenil-2)butin-3-ol-2 < 2-(3-metiltiofenil-2)butin -3-ol-2 < 2-(5-bromtiofenil-2)butin-3ol-2 < 2-(5-xlortiofenil-2)butin-3-ol-2 < 2-(piridinil-4)butin-3-ol-2 < 2-(furanil-2)butin-3-ol-2 ortib borishi tartibida aniqlandi.

Sintez qilingan atsetilen diollari tarkibi element analiz qilindi (2-jadval).

1-Jadval

Atsetilen diollari unumiga erituvchilar tabiatining ta’siri

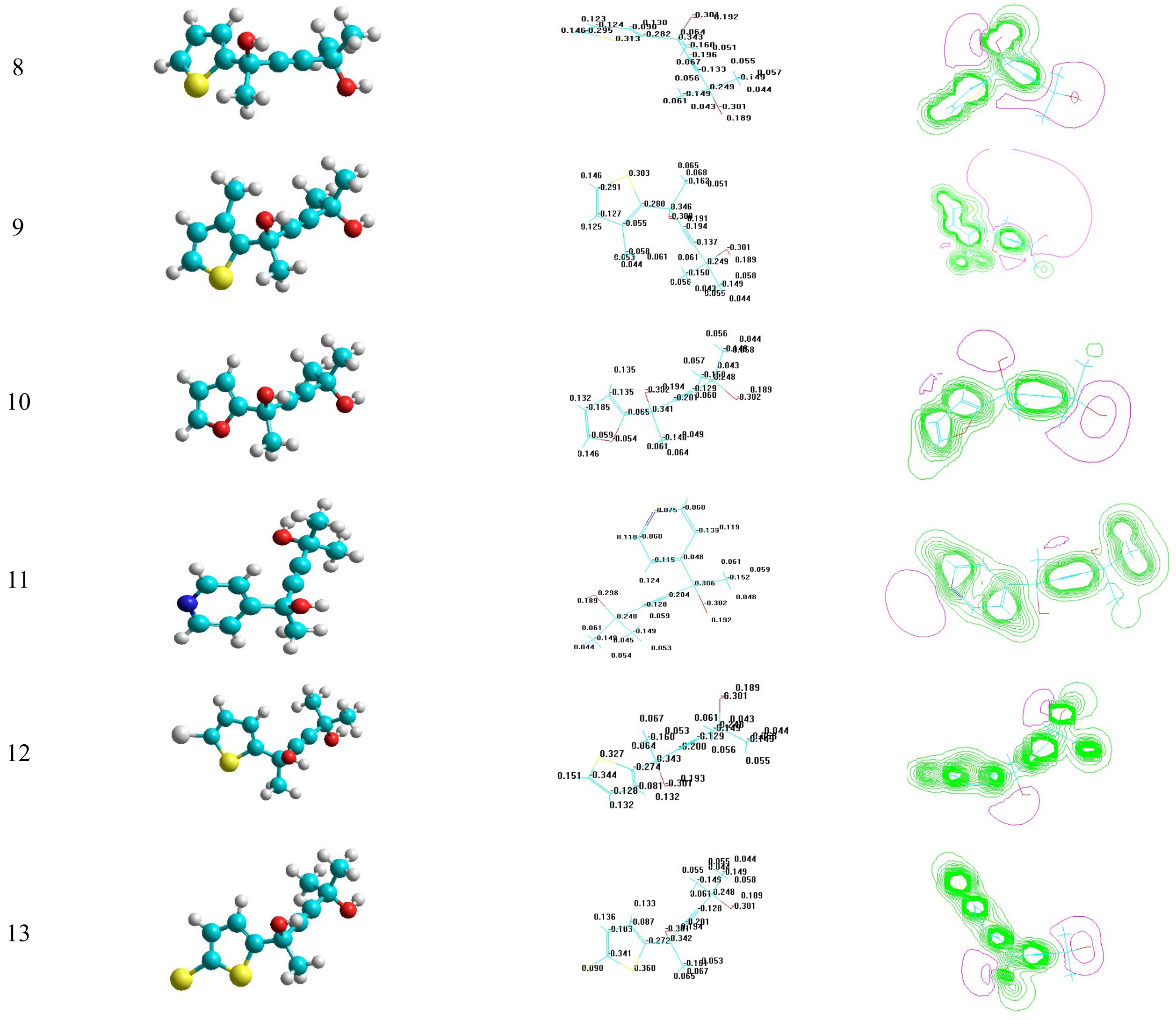
Erituvchi	Mahsulot unumi, %					
	8	9	10	11	12	13
DMSO	66	72	92	89	84	78
DMFA	62	68	88	84	81	76

2-Jadval

Sintez qilingan atsetilen diollarining element tahlili natijalari

AC	Brutto formulasi	Tahlil natijalari	Elementlar nomi va tahlili, %						
			C	H	O	S	N	Cl	Br
8	$C_{11}H_{14}O_2S$	Hisoblangan	62,83	6,66	15,23	15,23			
	Mr=210 gr/mol	Aniqlangan	62,83	6,71	15,22	15,25			
9	$C_{12}H_{16}O_2S$	Hisoblangan	64,28	7,14	14,28	14,28			
	Mr=224 gr/mol	Aniqlangan	64,25	7,19	14,28	14,29			
10	$C_{11}H_{14}O_3$	Hisoblangan	68,04	7,02	24,74				
	Mr=194 gr/mol	Aniqlangan	68,02	7,27	24,71				
11	$C_{12}H_{15}NO_2$	Hisoblangan	70,24	7,31	15,60		6,82		
	Mr=205 gr/mol	Aniqlangan	70,22	7,37	15,59		6,82		
12	$C_{11}H_{13}ClO_2S$	Hisoblangan	53,98	5,31	13,08	13,08		14,51	
	Mr=244,5 gr/mol	Aniqlangan	53,98	5,35	13,07	13,10		14,49	
13	$C_{11}H_{13}BrO_2S$	Hisoblangan	45,67	4,49	11,07	11,07			27,68
	Mr =289 gr/mol	Aniqlangan	45,69	4,53	11,07	11,09			27,63

Sintez qilingan atsetilen diollarining molekulalarining fazoviy tuzilishi, molekulalarda zaryadlarning va elektron zichlikning taqsimlanishi HyperChem Activation 7,0 paketi STAT dasturi bo‘yicha aniqlandi (2-Rasm).



Molekulasining 3D struktura tuzilishi

Molekulasida elektron zichlikning taqsimlanishi

Molekuladagi atomlar zaryad qiymati

2-Rasm. Sintez qilingan atsetilen diollarining molekulalarining fazoviy tuzilishi.

3- Jadval

Atsetilen diollarining kvant-kimyoviy hisoblashlari

AD	Umumiy energiyasi, kkal/mol	Hosil bo’lish energiyasi, kkal/mol	Issiqlik energiyasi, kkal/mol	Elektron energiyasi, kkal/mol	Yadro energiyasi, kkal/mol	Dipol momenti (D)	Kis lorod atomi zaryadi	Kis lorod atomi zaryadi
8	-52828,4	-2816,3	-21,56	-306062,9	223234,4	2,334	-0,301	-0,301
9	-56279,5	-3099,3	-29,54	-34957,9	293293,3	2,531	-0,301	-0,300
10	-53300,29	-2846,24	-58,34	-314799,3	259499,1	2,056	-0,302	-0,302
11	-55371,4	-3088,6	-24,29	-335725,7	280354,3	4,69	-0,302	-0,298
12	-59775,5	-2796,1	-24,48	-341566,9	281791,4	2,712	-0,301	-0,301
13	-60618,2	-2777,5	-8,16	-341222,3	280604,2	2,799	-0,301	-0,301

Atsetilen diollari kvant-kimyoviy ko‘rsatkichlari– molekulaning umumiy energiyasi, boshlang‘ich energiyasi, issiqlik energiyasi, elektron energiyasi, yadro energiyasi, dipol momenti va kislorod atomi zaryadi HyperChem Activation 7,0 paketi STAT dasturining yarim empirik usuli bo‘yicha aniqlandi (3-Jadval).

Xulosa

Ushbu tadqiqot ishida molekulasi tarkibida geteroatom o‘rinbosarlar saqlagan atsetilen spirtlari– 2-(tiofenil-2)butin-3-ol-2, 2-(3-metiltiofenil-2)butin-3-ol-2, 2-(furanil-2)butin-3-ol-2, 2-(piridinil-4)butin-3-ol-2, 2-(5-xlortiofenil-2)butin-3-ol-2, 2-(5-bromtiofenil-2)butin-3ol-2 ni $Bu_4NOH/DMSO/H_2O$ katalitik sistemasi ishtirokida erituvchi dimetilsulfoksidda atseton bilan reaksiyalari asosida atsetilen diollari sintez qilingan. Mahsulot unumiga boshlang‘ich moddalar mol miqdori nisbatlari, reaksiya davomiyligi, harorat, katalizator va erituvchilar tabiati ta’siri tizimli ravishda o‘rganilgan. Sintez qilingan yangi avlod atsetilen diollarining tarkibi, tozaligi va tuzilishi zamonaviy fizik-kimyoviy usullarda isbotlangan. Reaksiya jarayonining mexanizmi ishlab chiqilgan. Sintez qilingan atsetilen spirtlarining element tahlili amalga oshirilgan hamda tuzilishi va tarkibi zamonaviy fizik-kimyoviy tahlil usullarida (^{1}H- YaMR, ^{13}C-YaMR) isbotlangan. Atsetilen diolarini sintez qilishda, atsetilen spirtlarining nukleofil birikish reaksiyasiga moyillik qatorini aniqlash maqsadida molekulasi tarkibida geteroatom saqlagan o‘rinbosarlar tabiati ularning fazoviy joylashuvi va ta’sir etish xususiyatiga ko‘ra samaradorlik qatori quyidagicha 2-(tiofenil-2)butin-3-ol-2 < 2-(3-metiltiofenil-2)butin-3-ol-2< 2-(5-bromtiofenil -2)butin-3ol-2 < 2-(5-xlortiofenil-2)butin-3-ol-2 < 2-(piridinil-4)butin-3-ol-2 < 2-(furanil-2)butin-3-ol-2ortib borishi aniqlandi.

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