O`ZBEKISTON RESPUBLIKASI OLIY VA O`RTA MAXSUS TA'LIM VAZIRLIGI
NAMANGAN MUHANDISLIK-TEXNOLOGIYA INSTITUTI
"KIMYO TEXNOLOGIYA" FAKULTETI

"KIMYO" FANIDAN

Referati

Bajardi: ***5u-15 guruhi talabasi***
Ko'kanova N

Qabul qildi: ***Hoshimov F.***

Namangan 2016.

Mavzu: To`yingan va to`yinmagan uglevodorodlarning olinishi va xossalari.

Reja:

1. To`yingan uglevodorodlar haqida tushuncha.
2. To'yingan uglevodorodlarning tabiatda uchrashi va olinishi.
3. To`yinmagan uglevodorodlar nomlanishi, izomeriyasi.
4. To`yinmagan uglevodorodlar xossalari va ishlatilishi.

Molekulalaridagi uglerod atomlari o'zaro oddiy (-bog'lar bilan bog'langan va qolgan valentliklari vodorod atomi bilan to'yingan birikmalar to'yingan uglevodorodlar yoki alkanlar (parafinlar) deb ataladi.

Parafinlar deyilishiga sabab oddiy sharoitda hech qanaqangi kimyoviy reaksiyaga kirishmaydi, o'ta passiv moddalardir.

Gomologik qatori quyidagicha:

CH_4 – metan C_2H_6 - etan
C_3H_8 – propan C_4H_{10} - butan
C_5H_{12} – pentan C_6H_{14} - geksan
C_7H_{16} – geptan C_8H_{18} - oktan
C_9H_{20} – nonan $C_{10}H_{22}$ – dekan.

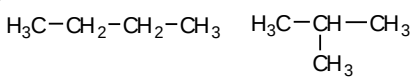
Umumiy formulasi – C_nH_{2n+2}

Tuzilish va kimyoviy xossalari o'xshash bo'lib, tarkibi bir yoki bir necha CH_2 guruh bilan farq qiluvchi moddalar qatori gomologik qator deyiladi. Moddalar esa gomologlar deyiladi.

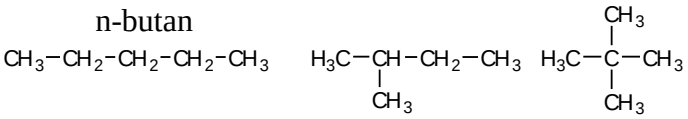
Izomeriya. Organik moddalarning anorganik moddalardan farqi ular orasidagi izomeriya hodisasining juda keng uchrashidir.

Izomeriya grekcha so'zdan olingan bo'lib, teng qism degan ma`noni bildiradi. Bu terminni fanga Shved olimi Ya.Bertselius tomonidan kiritilgan. Kimyoviy tarkibi va molekulyar massasi bir xil, lekin tuzilish formulasi va fizik-kimyoviy xossalari turlicha bo'lgan moddalar izomer moddalar yoki izomeriya deyiladi.

Metan, etan, propanning izomeri yo'q. Butanning ikkita, pentanning uchta izomeri mavjud.



n-butan



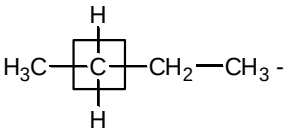
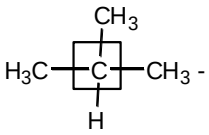
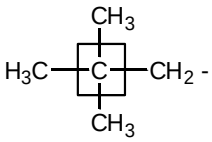
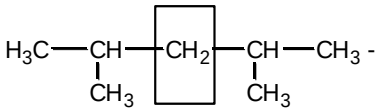
n-pentan izopentan neopentan

To’g’ri zanjirli ko’rinishdagi birikmalarga normal birikmalar deyiladi va n-harfi bilan belgilanadi. Izobutan, izopentan va neopentandagi uglerod zanjiri esa tarmoqlangan. Bunday birikmalar izobirikmalar deyiladi. Bu izomeriya struktura izomeriya yoki uglerod skeletining izomeriyasi deyiladi. Uglevodorod molekulasidagi uglerod atomlarining soni ortib borishi bilan izomerlarning soni ham tez ortib boradi.

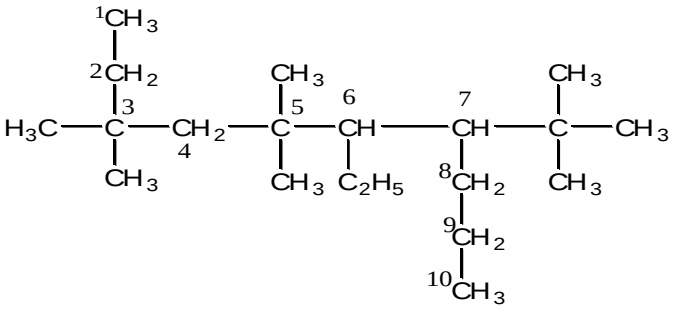
To’yingan uglevodorod molekulasidan bitta vodorod atomi olinsa, ularning (radikallari hosil bo’ladi ya`ni C_nH_{2n+1}).

Ular juda beqaror, reaktsiyaga aktiv kirisha oladigan zarrachalardir. Ularni nomlashda –an qo’shimchasi –il ga almashtiriladi.

Nomenklaturasi Metan, etan, propan, butan – tasodifiy nom berilgan.
Ratsional va sistematik nomenklatura asosida nomlanadi. Masalan,

	r.n.	s.n.
CH_4	metan	metan
	Metil, etil metan	n-butan
	trimetilmetan	2-metilpropan
	tetrametilmetan	2,2-dimetil-metan
	diizopropil-metan	2,4-dimetil pentan

Murakkabroq strukturali moddalarni ratsional nomenklaturada nomlash qiyinlik tug’dirgani uchun ko’proq sistematik nomenklaturada nomlanadi. Masalan



3,3,5,5-tetrametil-6-etil-7-izobutil dekan

To’yingan uglevodorodlarning tabiatda uchrashi va olinishi.

To’yingan uglevodorodlarning quyi vakillari tabiiy gazning tarkibiy qismini tashkil qiladi.

Qattiq holdagi to’yingan uglevodorodlar bitum, asfalt, azokerit (tog’ mumi) larning asosiy tarkibiy qismidir, neft to’yingan uglevodorodlar aralashmasiga boy tabiiy manbadir.

To’yingan uglevodorodlarning ba`zi vakillari o’simliklardan ajratib olingan.

Parafin uglevodorodlari fiziologik aktiv moddalar bo’lmasada, lekin kuchli erituvchilar hisoblanadi, shu sababli organizm uchun xavflidir.

Olinish usullari (sanoatda)

1.Elementlardan sintez qilib olish.

ë $C + 2H_2 \rightarrow CH_4$ (1868 yil, Bertlo)

qo’ng’ir ko’mirni gidrogenlash natijasida to’yingan uglevodorodlar olinadi, masalan shu usul bilan olinadi, bunda sun`iy benzin olish mumkin.

$$C + 2H_2 \xrightarrow[200\text{-}300 атм]{Fe,450\text{-}500^0C} CH_4$$

2.Uglerod (QQ)-oksidini gidrogenlash orqali to’yingan uglevodorodlarni olish (F.Fisher).

$$nCO + (2n+4)H_2 \xrightarrow[200^0,P]{Fe,Co} C_nH_{2n+2} + nH_2O$$

Bunda asosan n-tuzilishli to’yingan uglevodorodlarining aralashmasi hosil bo’ladi va «Sintin» deb ataladi.

3.Neft mahsulotlarini krekinglash natijasida to’yingan uglevodorodlar olinadi.

$$C_nH_{2n+2} \rightarrow C_nH_{2n+2} + C_nH_{2n}$$

Laboratoriyada olinish usullari

4.Alyuminiy karbidga suv ta`sir etish orqali metanni olinishi.

$$Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$$

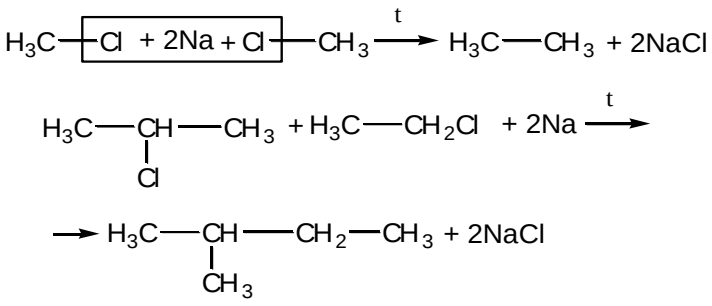
5.Metanni Bertlo usuli bo’yicha uglerod sulfiddan olinishi.

$$CS_2 + 2H_2S + 8Cu \xrightarrow{t} CH_4 + 4Cu_2S$$

6.Sirka kislota tuzidan (dekarboksillanish) olish.

$$CH_3COONa + NaOH \xrightarrow{t} CH_4 + Na_2CO_3$$

7.Vyurts reaksiyasi (1985). Alkanlarni galogenli hosilalarini natriy metali bilan qizdirib to’yingan uglevodorodlar vakillarini sintez qilib olish.



Bu reaksiyaning mexanizmini Shorigin tomonidan 1907-yilda aniqlangan. U quyidagi ikki bosqichdan iborat. Q. $CH_3Cl + 2Na \rightarrow \underset{natri\text{-}metilat}{CH_3 - Na} + NaCl$

QQ. $CH_3 - Na + Cl - CH_3 \rightarrow CH_3 - CH_3 + NaCl$

8. 1849 yilda Nemis olimi Kolbe organik kislota tuzlarini elektroliz qilib to'yingan uglevodorodlarni oladi.

$$2C_nH_{2n+1}COONa \xrightarrow{elektroliz} \underset{katod}{2Na^+} + \underset{anod}{2C_nH_{2n+1}COO^-}$$

katod $2Na^+ + 2e^- \rightarrow 2Na$

anod $2C_nH_{2n+1}COO^- \xrightarrow{-2e^-} 2C_nH_{2n+1}COO^\bullet \rightarrow$

$2C_nH_{2n+1}\Theta + 2CO_2$

9. Har xil birikmalarni qaytarish orqali.

$$CH_3Q + HQ \rightarrow CH_4 + Q_2$$
$$CH_3CH_2OH + 2HQ \rightarrow C_2H_6 + H_2O + Q_2$$
$$CH_3COOH + 6HQ \rightarrow CH_3\text{-}CH_3 + 3Q_2 + 2H_2O$$
$$C_2H_5Q + [H] \rightarrow C_2H_6 + HQ$$
$$C_2H_5\text{-}NH_2 + [H] \rightarrow C_2H_6 + NH_3$$

10. To'yinmagan va o'ta to'yinmagan uglevodorodlarni gidrogenlash.

$$H_2C = CH_2 + H_2 \xrightarrow{Ni,Pt,Pd} CH_3 - CH_3$$
$$HC \equiv CH + 2H_2 \xrightarrow{Ni,Pt,Pd} CH_3 - CH_3$$

11. Metall organik birikmalarni suv ta`sirida parchalash usuli bilan ham to'yingan uglevodorodlarni olish mumkin.

$$Zn(CH_3)_2 + 2HOH \rightarrow 2CH_4 + Zn(OH)_2$$
$$Zn(C_2H_5)_2 + 2HOH \rightarrow 2C_2H_6 + Zn(OH)_2$$

Grinyar reaktivi orqali to'yingan uglevodorodlarni olish: dastlab Grinyar reaktivi olinadi. Olingan magniy organik birikma suv ta`sirida parchalanib to'yingan uglevodorodlar olinadi.

$$CH_3Q + Mg \xrightarrow{efir} CH_3\text{-}Mg\text{-}Q$$
$$CH_3MgQ + HOH \rightarrow CH_4 + Mg(OH)Q$$

Fizik xossalari. Alkanlarning dastlabki vakillari C_1-C_4 oddiy sharoitda gaz holidagi moddalar, C_5-C_{16} gacha bo'lganlari suyuqlik va C_{17} - dan boshlab esa qattiq moddalardir.

Gomologik qatorda uglerod atomlarining soni ortishi bilan alkanlarning suyuqlanish va qaynash harorati hamda solishtirma og'irligi oshib boradi.

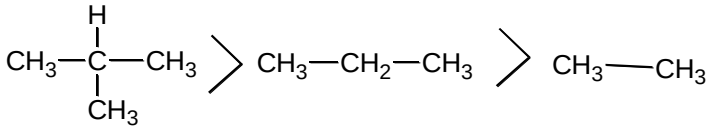
Alkanlarning solishtirma og'irligi va zichligi gomologik qatordagi uglevodorodlarning molekulyar og'irligi oshishi bilan ortib boradi.

Alkanlarning solishtirma og'irligi va zichligi gomologik qatordagi uglevodorodlarning molekulyar og'irligi oshishi bilan ortib boradi.

Tarmoqlangan zanjirli izomerlarning qaynash haroratlari normal zanjirli izomerlarnikidan pastroq bo'ladi. Masalan, n-pentan 360 ^{0}C da, izopentan 280 ^{0}C da qaynaydi. To'yingan uglevodorodlar suvda juda yomon eriydi, organik erituvchilarda yaxshi eriydi.

Alkanlarning IQ-spektrlarida C-H bog'ga tegishli yutilish chiziqlari 2000-2850 sm-1 ularning deformatsiyali tebranishi 1470-1380 sm-1 da chiqadi.UB-spektrda 200, 125, 135 nm da max larga ega.

Kimyoviy xossalari. To'yingan uglevodorodlarda C-C ва C-H bog'lari bo'lib, ular juda kuchsiz qutblanishga ega, lekin bog'lanish energiyasi yuqori. Ular birikish reaktsiyalariga kirishmaydi. Oddiy sharoitda kuchli oksidlovchilar $KMnO_4$, K_2CrO_4, $K_2Cr_2O_7$ va boshqalar ta`sir etmaydi. Faqat kuchli oksidlovchilar, katalizator ishtirokida va yuqori haroratlarda almashinish reaksiyalariga kirishadi. Almashinish reaksiyalariga uchlamchi uglerod atomidagi vodorod atomlari osonroq, ikkilamchi uglerod atomidagi vodorod atomi esa qiyinroq, birlamchi uglerod atomidagi vodorod esa qiyin almashinadi.



1. Galogenlanish reaksiyalari.

Galogenlar yorug'lik nuri ta`sirida to'yingan uglevodorodlar bilan reaksiyaga kirishadi.

Metanga xlor ta`sir ettirilganda metanning vodorod atomlari birin-ketin xlor atomlariga almashinadi va vodorod xlorid ajralib chiqadi:

$$CH_4 + Cl_2 \xrightarrow{h\nu} \underset{metilxlorid}{CH_3Cl} + HCl$$

$$CH_3Cl + Cl_2 \xrightarrow{h\nu} \underset{metilenxlorid}{CH_2Cl_2} + HCl$$

$$CH_2Cl_2 + Cl_2 \xrightarrow{h\nu} \underset{xloroform}{CHCl_3} + HCl$$

$$CHCl_3 + Cl_2 \xrightarrow{h\nu} \underset{uglerod(IV)xlorid}{CCl_4} + HCl$$

Metanning yorug'lik nuri ta`sirida xlorlanishi, erkin radikalli mexanizmda boradi va zanjir reaksiya deyiladi. Dastlab xlor molekulasi radikallarga ajraladi. Ya`ni,

$$Cl^{\bullet}\big|_{\bullet}Cl \xrightarrow{h\nu} 2Cl^{\bullet}$$

$$CH_4 + Cl^{\bullet} \rightarrow CH_3^{\bullet} + HCl$$

$$CH_3^{\bullet} + Cl_2 \rightarrow CH_3Cl + Cl^{\bullet}$$

$$CH_3Cl + Cl^{\bullet} \rightarrow CH_2Cl^{\bullet} + HCl$$

$$CH_2Cl^{\bullet} + Cl_2 \rightarrow CH_2Cl_2 + Cl^{\bullet}$$

$$CH_2Cl_2 + Cl^{\bullet} \rightarrow CHCl_2^{\bullet} + HCl$$

$$CHCl_2^{\bullet} + Cl_2 \rightarrow CHCl_3 + Cl^{\bullet}$$

$$CHCl_3 + Cl^{\bullet} \rightarrow CCl_3^{\bullet} + HCl$$

$$CCl_3^{\bullet} + Cl_2 \rightarrow CCl_4 + Cl^{\bullet}$$

Ortib qolgan Cl(radikali boshqa molekulani turtib radikalga aylantiradi va zanjirli mexanizmda boradigan reaksiyani davom ettiradi.

Agar metan (issiqlik) ta`sirida xlorlansa reaksiya portlash bilan borib, vodorod xlorid va ko`mir hosil bo'ladi:

$$CH_4 + 2Cl_2 \xrightarrow{t} 4HCl + C$$

Xlorlanish va bromlanish reaksiyalari yorug'lik nuri ta`sirida nisbatan oson boradi. Ftor bilan esa reaksiya portlash bilan boradi.

$$CH_4 + 4F_2 \rightarrow CF_4 + 4HF$$

Shuning uchun bu reaksiya erituvchi ishtirokida olib boriladi.

Metan yod bilan reaksiyaga qiyin kirishadi. Chunki reaksiya oxirigacha bormaydi. Hosil bo'lgan modda va boshlang'ich modda o'rtasida kimyoviy muvozanat vujudga keladi.

$$CH_4 + I_2 \Leftrightarrow CH_3I + HI$$

Demak bu reaksiyalarni quyidagi tartibda boradi deyish mumkin:

$$F_2 > Cl_2 > Br_2 > I_2$$

yod bilan bu reaksiya qaytar xarakterga ega.

2.Nitrolanish reaksiyasi. Kontsentrlangan kislotalar oddiy sharoitda ta`sir etmaydi. Qizdirilganda esa parchalanadi.

Konovalov (1888) ma`lum sharoitda suyultirilgan nitrat kislotasi alkanlarni nitrolab nitrobirikmalar hosil qilishni ko'rsatdi.

$$\underset{n-propan}{CH_3-CH_2-CH_3} + \underset{suyul.12-14\%}{HONO_2} \xrightarrow[t,p]{140^0} CH_3-\underset{\downarrow}{CH}-CH_3 + H_2O$$

$$NO_2$$

2-nitropropan

Mexanizm:

$$HONO_2 \rightarrow HO^{\bullet} + NO_2^{\bullet}$$

$$CH_3-CH_2-CH_3 + HO^{\bullet} \rightarrow CH_3-{}^{\bullet}CH-CH_3 + H_2O$$

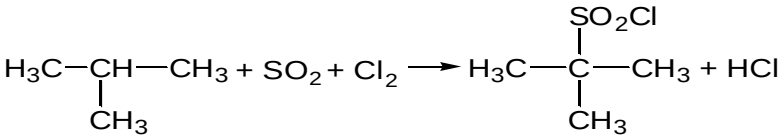
$$CH_3-{}^{\bullet}CH-CH_3 + NO_2^{\bullet} \rightarrow CH_3-\underset{\downarrow}{CH}-CH_3$$

$$NO_2$$

Bu reaksiyada asosiy mahsulot 2-nitropropan lekin kam miqdorda bo'lsada, 1-nitropropan ham hosil bo`ladi:

$$CH_3-CH_2-CH_2-NO_2$$

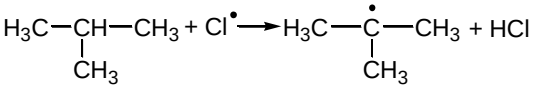
3. Sulfoxlorlash reaksiyasi yorug'lik nuri ta`sirida yoki qizdirilganda boradi va radikal o'rin olish mexanizmiga ega.

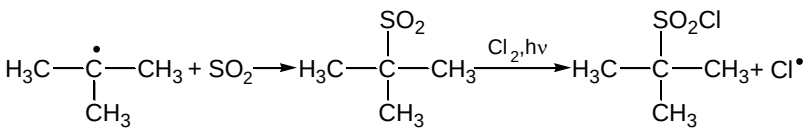


2-nitropropan 2-metil,2-sulfonilxlorid propan

Mexanizmi:

$$Cl_2 \xrightarrow{h\nu} 2Cl^{\bullet}$$





4. Sulfooksidlanish reaksiyasi.

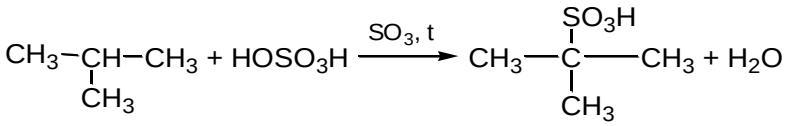
$$2R-H+2SO_2+O_2 \xrightarrow{t} \underset{sulfokislota}{2R-SO_2OH}$$

Alkansulfo kislotalar xosilalari (C_{10}-C_{16}) sintetik yuvish vositalari sifatida ishlatiladi.

$$R-SO_3H+NaOH \rightarrow R-SO_3Na+H_2O$$

5. Sulfolash reaktsiyasi.

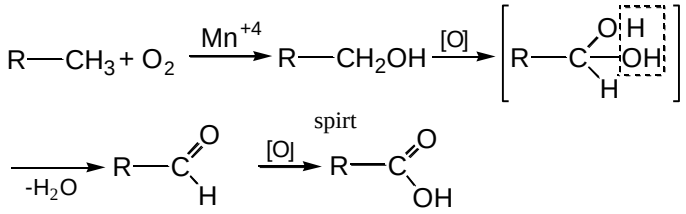
(Oleum $\rightarrow H_2SO_4+SO_3$)



6.Oksidlanish reaksiyalari. To'yingan uglevodorodlar yuqori haroratlarda (300 ^{0}C) oson alangalanib so'ngra yonadi va CO_2, H_2O hosil qiladi.

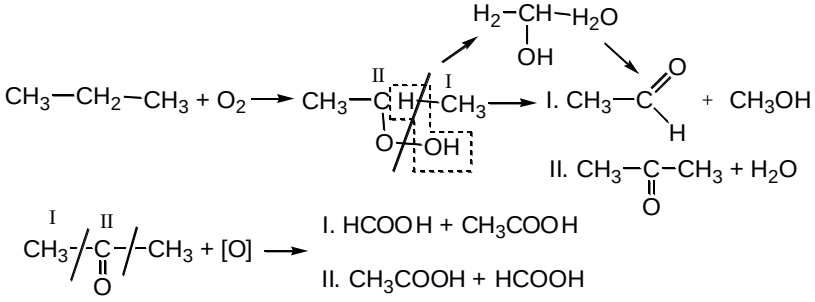
$$C_5H_{12}+8O_2 \xrightarrow{300^0} 5CO_2+6H_2O$$

Alkanlar yuqori bo'lmagan haroratlarda (200 ^{0}C), havodagi kislorod bilan marganets (IV)-oksidli katalizatorlar ishtirokida oksidlanadi. Bu reaksiya natijasida quyi molekulali uglevodorodlarning kislorodli birikmalarini hosil qiladi. Bunda uglerod-uglerod bog'lari uziladi va to'yingan kislotalar aralashmalari hosil bo'ladi.



Aldegid

Oksidlanish reaksiyalari ham radikal mexanizmda boradi.



8.Degidrogenlanish reaksiyasi.

$$C_4H_{10} \xrightarrow[-H_2]{Pd,Ni,t} C_4H_8 \xrightarrow[-H_2]{} C_4H_6$$

9.Alkanlarning pirolizi. Qizdirilganda birikmalarning parchalanish jarayoniga piroliz deyiladi. To'yingan uglevodorod molekulyar massasi qanchalik katta bo'lsa, ularning termik parchalanishi shunchalik oson bo'ladi.

$$2CH_4 \xrightarrow{1400^0} C_2H_2+C_2H_4+3H_2 \quad \Delta H=+95 \text{ kkal.}$$

$$C_2H_6 \xrightarrow{500\text{-}600^0} C_2H_4+C_2H_2+H_2$$

Uglevodorodlar pirolizga uchraganda uglerod zanjirining uzilishi, degidrogenlanishi, izomerlanishi, tsiklizatsiyalanishi va sintez jarayonlari sodir bo`ladi. Pirolizda erkin radikallar hosil bo`ladi.

10.Krekinglash (parchalash) reaksiyalari. Kreking jarayonida yuqori haroratda qaynaydigan og'ir molekulalar past haroratda qaynaydigan kichik uglevodorodlarga parchalanadi. Ya`ni benzinga aylanadi.

$$C_{12}H_{26} \rightarrow C_6H_{14} + C_6H_{12}$$

$T_{qay.}$q216^oC $t_{qay.}$q69^oC $t_{qay.}$q64^oC

$$C_8H_{18} \xrightarrow{\text{kreking, t}} C_4H_{10} + C_4H_8$$

$$C_8H_{18} \xrightarrow{\text{kat}} C_4H_{10} + C_4H_8$$

Katalizatorlar ishtirokida yuqori harorat va bosim ostida (760 mm simob ustuni) boradigan kreking (faqat gaz fazada) katalitik kreking deb ataladi.

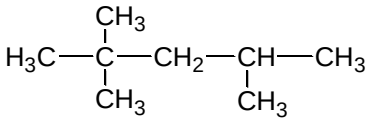
Kreking jarayonida turli uglevodorodlar aralashmasi hosil bo'lishi mumkin.

Masalan,

$$C_6H_{12} \rightarrow CH_4 + C_5H_{10}$$
$$C_2H_6 + C_4H_8$$
$$C_3H_8 + C_3H_6$$
$$C_4H_{10} + C_2H_4$$

Neftning og'ir fraktsiyalarini krekinglash olifenlarga boy va yuqori oktan soniga ega bo'lgan yengil benzinlar va gaz holidagi uglevodorodlarni olishda foydalaniladi.

Izooktan – C_8H_{18} (2,2,4 – trimetilpentan)



Bu modda aviatsiya benzinining asosiy tarkibiy qismini tashkil qiladi va standart suyuq yoqilg'i hisoblanadi.

Sintetik olinish yo'li:

$$2\underset{\text{изобутилен}}{C_4H_8} \rightarrow C_8H_{16} + H_2 \rightarrow \underset{\text{изооктан}}{C_8H_{18}}$$

Izooktan motor yoqilg'isi sifatida benzinning sifatini aniqlovchi moddadir. Shuning uchun benzinning sifati oktan soni bilan aniqlanadi. Izooktanning oktan soni 100 ga teng deb qabul qilingan. n–geptanning oktan soni nolga teng.

Ishlatilishi. To'yingan uglevodorodlarning pastki vakillaridan yoqilg'i smolalarida (CH_4 tabiiy gazning asosiy tarkibiy qismini tashkil qiladi) foydalaniladi.

Metandan sanoatda atsetilen, tsianid kislota, metil spirti, chumoli aldegidi, xlorli birikmalar, plastmassalar, nitron, sun`iy kauchuk, mineral o'g'itlar olishda foydalaniladi. Etan, propan, butan va boshqa yuqori vakillaridan sanoatda turli maqsadlarda foydalaniladi.

TO'YINMAGAN UGLEVODORODLAR

(Alkenlar yoki olefinlar)

To’yinmagan etilen qatori uglevodorodlarning (olefinlarning) galoid hosilalardan, spirtlardan (degidrotatsiyalash mexanizmi), parafinlardan krekinglash yo’li bilan olish. Xossalari va reaksiyalari: gidrogenlash, galoidvodorodlarni birikishi (mexanizmi), gidratatsiyalash (Butlerov), Vagner reaksiyasi bilan oksidlash, ozonlash. Qo’sh bog’ni aniqlashning sifat reaksiyasi. Birikish reaksiyasida qo’shbog’dagi o’rinbosarlarning ta‘siri (Markovnikov qoidasi). (+)(va (-)(effektlar to’g’risida tushuncha. Qo’sh bog’ geometriyasi (tabiati). Olefinlarni tsis- trans- izomeriyasi. Polimerlanish (polietilen).

Molekulalarida to’yingan uglevodorodlardagi (-bog’lardan tashqari (-bog’lar (qo’sh yoki uchbog’) hosil qiladigan uglevodorodlar to’yinmagan uglevodorodlar deyiladi. Qo’sh bog’ning hosil bo’ilishida (- va (-bog’lari qatnashadi.

Umumiy formulasi: $C_nH_{2n+2}-a$

a=2, 4, 6 va boshqalar

n=1 bunday to’yinmagan uglevodorodlar yo’q.

n=2 va a=2 etilen qatoridagi uglevodorodlar.

n=2 va a=4 atsetilen va dien qatoridagi uglevodorodlar (polienlar) kiradi.

Etilen qatoridagi uglevodorodlarning umumiy formulasi C_nH_{2n}. Etilen xlor bilan birikib $C_2H_4Cl_2$ etilen xlorid – lotincha olefinal – yog’simon moddani hosil qiladi. Shuning uchun etilen qatori uglevodorodlari olefinlar yoki alkenlar deb ham ataladi.

Alkenlarda qo’sh bog’ tutgan uglerod atomi ikkinchi valent holatida bo’lib, bu uglerod atomlari sp2-gibridlangan orbitallarga ega. Valent burchagi 120^0. (- va (-bog’lari bir-biridan farq qilib:

$C-C$ 83 kkal, $C=C$ 146 kkal.

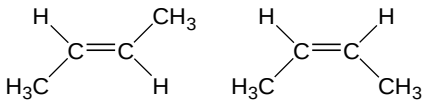
Uzunligi 0,54, 0,34

(-bog’ni uzish uchun kamroq (20 kkal) energiya sarflanadi.

(-bog’ning borligi tufayli etilen qatori uglevodorodlari ancha faol, oson uzilish bilan birikish reaksiyalariga kirishadi, oson qutblanadi. Ya`ni biror tashqi ta‘sir yoki atom va atomlar gruppasi ta‘sirida elektronlar zichligi uglerod atomining biridan ikkinchisiga qarab siljiydi.

Elektron zichlik kam- elektron zichlik ko’p

Fazoda etilen molekulasi tekislikda joylashgan bo’lib, etilen qatori uglevodorodlaridan qo’sh bog’ tutgan uglerod atomlaridan o’rinbosarlarni qo’sh bog’ tekisligining har xil tomoniga joylashishiga qarab geometrik izomeriyaga ega bo`ladi. Ya‘ni agar ikkala o’rinbosar bir tomonda bo’lsa, tsis-, har xil tomonda bo’lsa trans- izomer bo`ladi.



Trans- Tsis-

Demak olefinlar tuzilish va holat (qo’sh bog’ holatiga qarab) izomeriga ega.

Gomologik qatori, izomeriyasi, nomlanishi

C_2H_4 – etilen eten

C_3H_6 – propilen propen

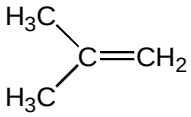
C_4H_8 – butilen buten

C_5H_{10} – amilen penten va boshqalar.

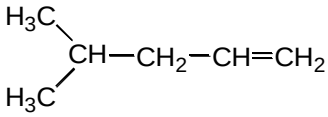
(Gomologik qator a`zolari bir-biridan guruh bilan farq qiladi). Etilen molekulasidagi hamma vodorodlar teng huquqli. Ularni turli o'rinbosarlarga almashinishidan har xil izomerlar hosil bo'ladi. Masalan,

$CH_2 = CH - CH_2 - CH_3$ – etil etilen

$CH_3 - CH = CH - CH_3$ (simmetrik) dimetil etilen



(Nosimmetrik) dimetiletilen



Izopropil etilen

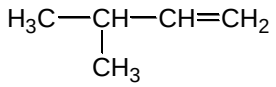
Nomlanishi. 1.Tarixiy yoki tasodifiy nomenklaturaga ko'ra to'yingan uglevodorodlar nomidagi "an" qo'shimchani "ilen" qo'shimchasiga almashtirish yo'li bilan hosil qilinadi. Faqat $C_5H_{10} - amilen$ (aslida pentilen) bundan mustasnodir.

2.Ratsional nomenklaturada olefinlarning nomi radikallar nomiga etilen so'zini qo'shish bilan hosil qilinadi.

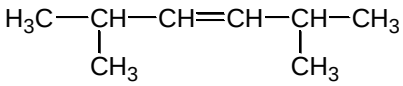
Masalan:

$CH_3 - CH = CH_2 -$ metil etilen

$CH_3 - CH = CH - CH_3 -$ dimetil etilen

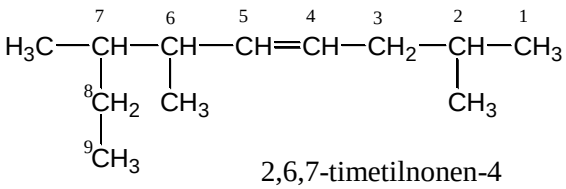


Izopropil etilen

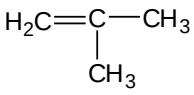


Diizopropil etilen

3.Jeneva (sistematik) nomenklaturasiga ko'ra olefinlar alkenlar deyiladi. –an qo'shimchasi –en ga almashtiriladi. Qo'shbog' saqlagan eng uzun zanjir asosiy zanjir deb olinadi va nomerlash qo'shbog' yaqin turgan tomondan boshlanadi. Masalan,



2,6,7-timetilnonen-4



T. izobutilen

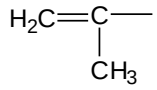
P. dimetil etilen

C. 2 – metilpropen

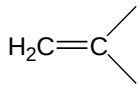
To’yinmagan uglevodorodlarning radikallari quyidagicha nomlanadi:

$CH_2 = CH -$ vinil

$CH_2 = CH - CH_2 -$ allil



- izopropenil



- vinilidin

$CH_3 - CH = CH -$ propenil (propenil-1)

Izomeriyasi. C_5H_{10} da uglerod skeleti va qo’shbog’ holatining izomeriyasi quyidagichadir:

1. $CH_2 = CH - CH_2 - CH_2 - CH_3$ T. amilen

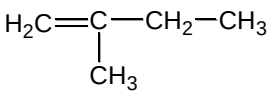
P. propil etilen

C. пентен-1

2. $CH_3 - CH = CH - CH_2 - CH_3$ T. amilen

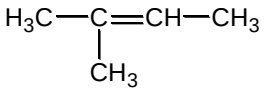
P. metiletiletilen

C. penten-2

3 

T. γ-amilen

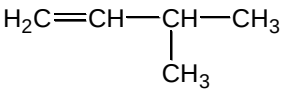
P. nosimmetrik metil etilen



4

T. β-izoamilen

P. trimetil etilen



5

C. 2-metil buten-2

T. izoamil

P. izopropiletilen

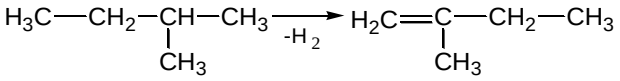
C. 3-metil buten-1

Olinish usullari**.**

1.To’yingan uglevodorodlarni degidrogenlash orqali.

$$C_nH_{2n+2} \xrightarrow[-H_2]{Ni,Pt,Pd,400^0} C_nH_{2n}$$

$$C_4H_{10} \xrightarrow[-H_2]{} C_4H_8 \xrightarrow[-H_2]{} C_4H_6$$ - butadien



$$CH_3 - CH = CH - CH_3 + H_2$$

$$CH_3 - CH_2 - CH_2 - CH_3 \xrightarrow[300^0]{Cr_2O_3}$$

$$CH_2 = CH - CH_2 - CH_3 + H_2$$

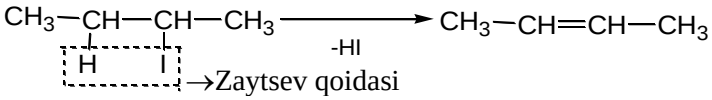
Olefinlar neft mahsulotlaridan va organik birikmalarni quruq haydash bilan hosil qilinadi.

2.Atsetilen qatori uglevodorodlarni gidrogenlab etilen ugdevodorodlar olinadi:

$$HC \equiv CH + H_2 \xrightarrow[180\text{-}200^o]{Pt,Pd} CH_2 = CH_2$$

3.Monogalogenli xosilalardan olinishi. Bu reaksiyalarda galogenli hosilaga natriy alkogolyat yoki ishqorning spirtdagi eritmasi ta`sir ettirib galoid vodorod ajralib chiqadi va qo'sh bog' hosil bo'ladi. Galogenning ajralishi Zaytsev qoidasiga binoan amalga oshadi:

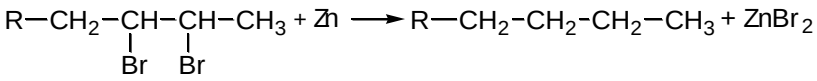
$$CH_3 - CH_2 - CH_2Cl + NaOC_2H_5 \rightarrow$$
$$\rightarrow CH_3 - CH = CH_2 + NaCl + C_2H_5OH$$



→Zaytsev qoidasi

$$CH_3 - CH_2 - CH_2 - [Cl + K]OH(H_2O) \rightarrow CH_3 - CH_2 - CH_2OH + KCl$$
$$CH_3 - CH_2 - CH_2 - Cl + KOH(spirt) \rightarrow C_3H_6 + HCl$$

4.Digalogenli uglevodorodlarga rux kukuni yoki rux qirindisi ishtirokida spirtning suvli aralashmasi ta'sir ettirilganida, sof holidagi olefinlar olinadi:

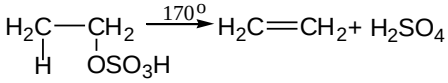


5.Sanoatda va laboratoriyada to'yingan spirtlarni yuqori harorat (160-180^{o}C) da degidratlash usuli bilan ham olefinlarni sintez qilinadi. Bu sintez suvni tortib oluvchi agentlar ishtirokida (Al_2O_3, H_2SO_4), amalga oshadi. Ikkilamchi spirtlar esa Zaytsev qoidasiga binoan degidratlanadi, ya`ni vodorod kamroq gidrogenlangan uglerod atomidan ajraladi.

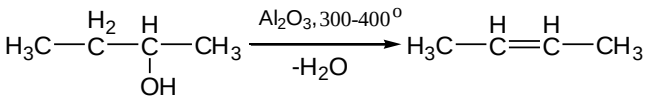
$$CH_3 - CH_2 - CH_2OH \xrightarrow[350\text{-}500^o]{Al_2O_3} CH_3 - CH = CH_2 + H_2O$$

I. $CH_3 - CH_2OH + HOSO_3H \rightarrow C_2H_5OSO_3H + H_2O$

II.



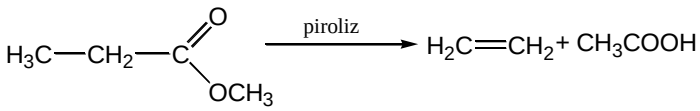
III.



6.Alkanlarni krekinglash orqali. Bu asosiy sanoat usuli hisoblanadi.

$$CH_3 - CH_3 \xrightarrow{500^o} CH_2 = CH_2 + C_2H_2 + H_2$$
$$C_3H_8 \xrightarrow{460^o} C_3H_6 + C_2H_4 + CH_4$$

7.Laboratoriya sharoitida sirka kislota efirlarini (450-500^{o}C da) piroliz qilib olinadi.



Metiltrifenil fosforbromid:

$$[(C_6H_5)_3PCH_3]Br + C_4H_9Li \rightarrow [(C_6H_5)_3P^+ = CH_2] + C_4H_{10} + LiBr$$

$$[(C_6H_5)_3P^+ = CH_2] + O = CH - CH_2 - C_4H_9 \rightarrow$$

$$\rightarrow (C_6H_5)_3P = O + CH_2 = CH - CH_2 - CH_2 - CH_2 - CH_3$$

Olefinlarning fizikaviy xossalari

Etilen, Propilen, *Butilen* — *Gazlar*

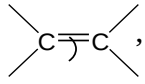
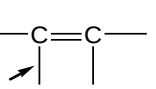
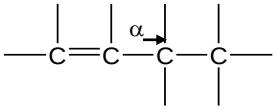
$C_5H_{10} - C_{17}H_{34}$ – *suyuqliklar*

$C_{18}H_{36}$ – *qattiq* moddalar

Boshqa uglevodorodlar singari suvda erimaydi, organik erituvchilarda (metanoldan boshqalarida) yaxshi eriydi. Xarakterli o'tkir hidga ega.

Zichliklari suvnikidan kichik. IQ spektrda qo'sh bog' 1680-1640 sm^{-1}, deformatsion tebranish trans- izomer uchun 965 sm^{-1}, tsis- izomer uchun 700 sm^{-1} ga ega. UF spektrlarida 165-200 nm max ga ega.

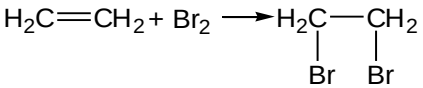
Kimyoviy xossalari. Molekulasidagi qo'sh bog' tufayli etilen qatorida uglevodorodlar reaksiyaga kirishish qobiliyati katta bo'lgan moddalardir. Ular qo'shbog'ning uzilishi hisobiga birikish, polimerlanish, oson oksidlanish va almashinish reaksiyalariga kirishadi.

1)  , 2)  , 3) 

1.Birikish reaksiyalari. Olefinlarning 1 mol vodorodni biriktirib olishi gidrogenlanish reaksiyasi deb ataladi.

$$CH_2 = CH_2 + H_2 \xrightarrow{150\text{-}200^0, Ni, Pt} CH_3 - CH_3$$

To'yinmagan uglevodorodlar galogenlarni oson biriktiradi. Asosan xlor va bromni juda oson biriktirib oladi, ftor bilan juda tez, yod bilan esa sust reaksiya ketadi.



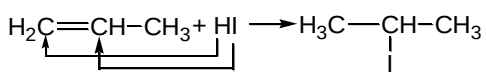
$$Br_2 \xrightarrow{h\nu} 2Br^{\bullet}$$

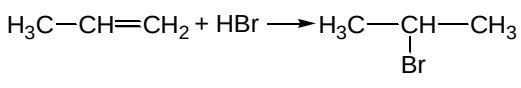
Bu reaksiya radikal yoki ionli mexanizmda boradi va qo'sh bog' tutgan uglevodorodlar uchun sifat reaksiyasi bo'lib, xizmat qiladi (ya`ni bromli suvning rangsizlanishi).

$$\overset{\delta+}{C}H_2 = \overset{\delta-}{C}H_2 + \overset{\delta+}{Br}\cdots\overset{\delta-}{Br} \rightarrow Br^- + \underset{karbkation}{\overset{+}{C}H_2 - CH_2Br}$$

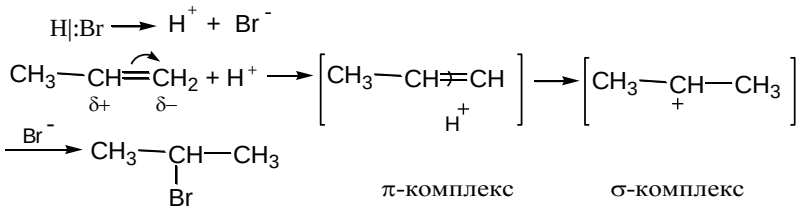
$$\rightarrow \underset{Simmetrik\text{-}dibrometan}{Br - CH_2 - CH_2 - Br}$$

2.Olefinlar galoidvodorodlarni Markovnikov qoidasiga binoan oson biriktirib oladi. Vodorod ko'proq gidrogenlangan uglerod atomiga va galogen kamroq gidrogenlangan uglerod atomiga birikadi. Bu reaksiya ionli mexanizmda boradi.

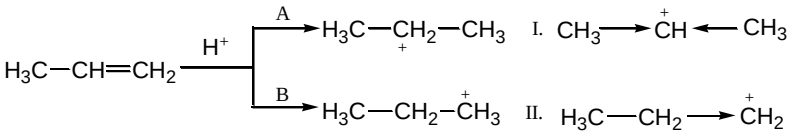




Reaksiya mexanizmi.



Bu reaksiyada olimlar borishi mumkin bo'lgan ikki xil variantni ko'rib chiqishdi.



I.Kationdagi (+) zaryad ikkala tomondan metil gruppasi bilan uchirilib turadi, buning natijasida kation I kam faollanish energiyasi va II kationga nisbatan tezroq hosil bo'ladi. II kationdagi musbat zaryad bitta metilen gruppasi bilan uchirilib turadi.

1939 yili Xarash va Mayo Markovnikov qoidasiga bo`ysunmasdan boradigan, vodorod peroksid ishtirokida radikal birikish mexanizmi bilan boradigan reaksiyani ochdilar.

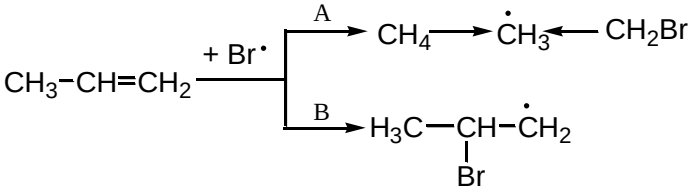
$$CH_3 \rightarrow CH = CH_2 + HBr \xrightarrow{H_2O_2, h\nu} CH_3 - CH_2 - CH_2Br$$

Reaksiya mexanizmi:

$$H \cdot \vert \cdot Br \xrightarrow{h\nu, H_2O_2} H^{\Theta} + Br^{\Theta}$$

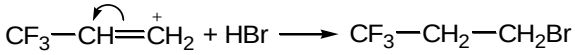
$$CH_3 - CH = CH_2 + Br^{\Theta} \rightarrow [CH_3 - \overset{\Theta}{C}H - CH_2Br] \xrightarrow[-Br^{\bullet}]{HBr} CH_3 - CH_2 - CH_2Br$$

Radikal ataka qilganda elektron zichligi ko'p bo'lgan uglerod atomiga birikadi. Reaksiya A yo'l bilan boradi.



A yo'l bilan olingan radikalning energiyasi kam va barqaror. Bu reaksiyani Markovnikov qoidasiga teskari borishini ko`rsatdi va Xarashning peroksidli-effektli reaksiyasi deb ham aytiladi.

Agar alken molekulasida elektronomanfiyligi kattaroq element bo`lsa ham bu alken Markovnikov qoidasiga teskari ravishda galoid vodorodlar bilan birikish reaksiyasiga kirishadi. Masalan,

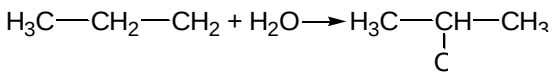


3.Suv va kislotalar ham Markovnikov qoidasiga binoan birikish reaksiyasiga kirishadi.

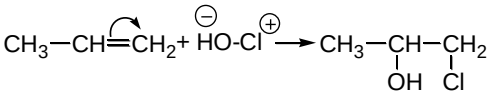
Gidratlanish reaksiyasi: $CH_2 = CH_2 + H_2O \xrightarrow{H_2SO_4} C_2H_5OH$

I. $CH_2=CH_2+HOSO_3H \rightarrow \underset{Etilsulfat\text{-}kislota}{CH_3-CH_2OSO_3H}$

II. $CH_3-CH_2OSO_3H+H_2O \xrightarrow[-H_2SO_4]{} \underset{etil-spirti}{CH_3-CH_2OH}$

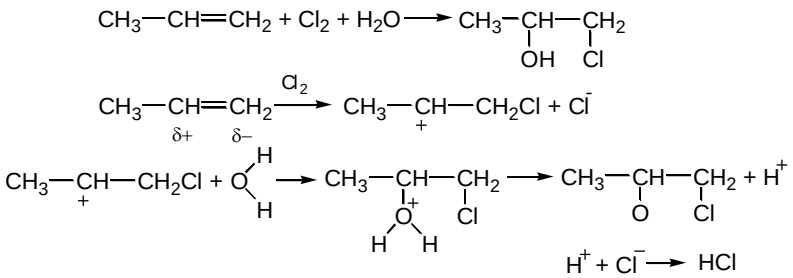


4.Gipoxlorlash reaktsiyasi:

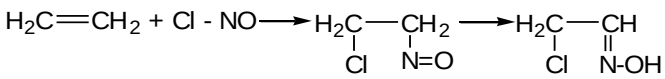


Propilen xlor gidrin yoki 1-xlorpropanol-2

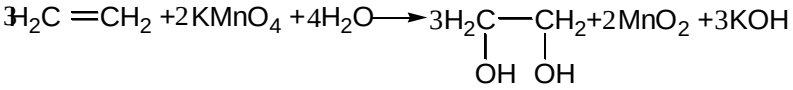
Bu reaksiya quyidagi reaksiya bilan teng huquqlidir.



Nitrozil xloridning birikishi:

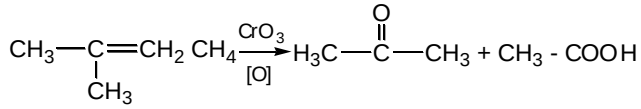


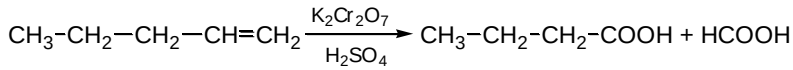
5.Olefinlarning oksidlanishi. $KMnO_4$ ning kuchsiz ishqoriy sharoitdagi eritmasi orqali oksidlanishi (Vagner reaktsiyasi).



Avval kaliy permanganat eritmasi rangsizlanadi, so'ngra eritma qo'ng'ir rangga bo'yaladi, ya`ni cho'kmaga tushadi. Natijada ikki atomli spirt (glikollar) hosil bo'ladi. Bu reaksiyadan to'yinmagan uglevodorodlarni sifatiy tahlil qilishda foydalaniladi.

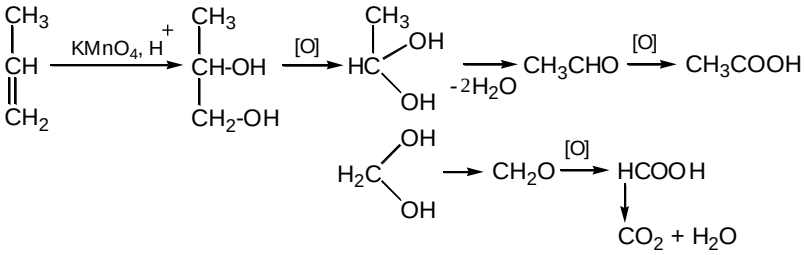
6.To'yinmagan uglevodorodlar shiddatli oksidlanganda, ya`ni kuchli oksidlovchilar ($K_2Cr_2O_7, K_2CrO_4$ va $HNO_3$ kislotalar) ta`sirida oksidlanib keton va kislotalar hosil qiladi. Masalan,



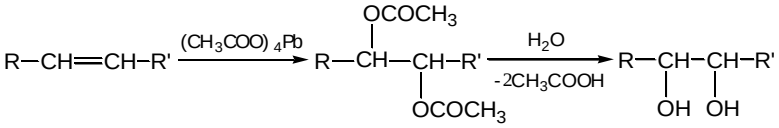


Bu reaksiya ham qo'sh bog' o'rnini aniqlashda ishlatiladi.

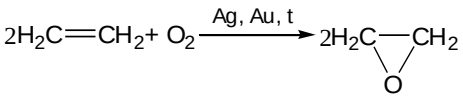
7. $KMnO_4$ eritmasi bilan kislotali sharoitda oksidlash.



8.Suvsiz sharoitda qo’rg’oshin tetraatsetat bilan oksidlash.

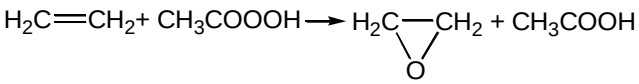


9.Havo kislorodi va kumush katalizatori ishtirokida oksidlash.

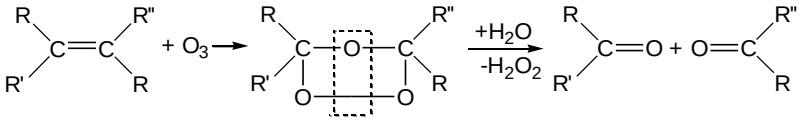


Etilenning oksidi yoki epoksidi

10.Nadkislotalar ishtirokida oksidlash reaksiyasi (N.A.Prilijaev).

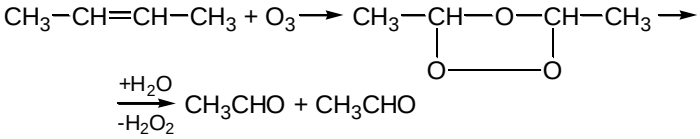


11.Ozonlanish reaksiyasi (Qo’sh bog’ni aniqlashda ishlatiladi).

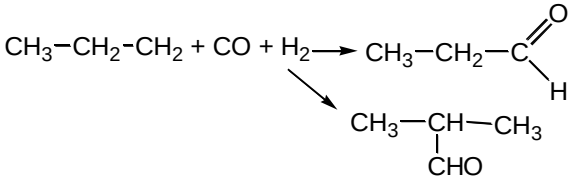


Ozonit

Ozonit juda beqaror bo’lib, suv ta‘sirida oson parchalanadi va karbonilli birikmalar aralashmasi hosil bo’ladi.



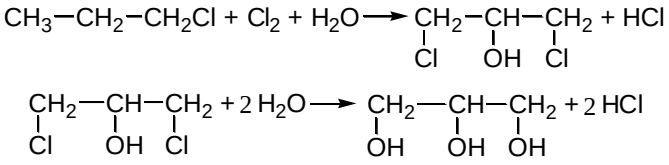
12.Oksosintez (Renie reaksivasi).



13.Allil holatdagi uglerod atomi vodorodining almashinishi.

$$CH_2=CH-CH_3+Cl_2 \xrightarrow{500^0C} CH_2=CH-CH_2Cl+HCl$$

Qo’sh bog’ saqlangan holda xlorlanish reaksiyasi boradi. Bu jarayondan sanoatda glitserin olishda foydalaniladi.



14.Polimerlanish reaksiyasi. Bu reaksiya Butlerov tomonidan ochilib izobutilenning di- va trimerlanishi ko'rilgan edi.

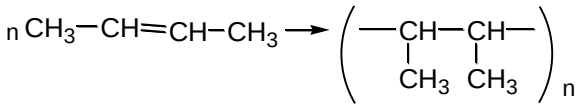
$$CH_2=CH_2+CH_2=CH_2+CH_2=CH_2+CH_2=CH_2\rightarrow$$
$$\xrightarrow{Al(C_2H_5)_3+TiCl_4}-CH_2-CH_2-CH_2-CH_2-CH_2-CH_2-$$
$$CH_2-CH_2\rightarrow(-CH_2-CH_2-)_n$$

$CH_2=CH_2-$ monomer

$-CH_2-$ elementar zveno

$(-CH_2-CH_2-)_n-$ polimer

Olefinlarning polimerlanishi ionli yoki radikal mexanizmda boradi.



Ishlatilishi. Etilen turli organik birikmalar sintez qilib olishda xom ashyo bo'lib hisoblanadi.

Sanoatda etilen, polietilen, etil spirti, etilenglikol va o'ta kuchli zaharlovchi modda ipritni sintez qilishda foydalaniladi. Polietilen radio va elektronika, qishloq xo'jaligida va boshqa sohalarda keng qo'llaniladi.