

**O‘zbekiston Respublikasi Sog‘liqni saqlash vazirligi
TOSHKENT FARMATSEVTIKA INSTITUTI
NOORGANIK, FIZIK VA KOLLOID KIMYO KAFEDRASI**

8-MA’RUZA:

**DAVRIY JADVALDAGI d-BLOK
METALLARI. 6-7 GURUH
ELEMENTLARI**

Ma’ruza mualliflari:

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REJA:

Mavzuning ma'ruza davomida yoritiladigan qismlari:

1. 6-7 guruh elementlarining umumiy tavsifi;
2. Xrom (II, III, IV, VI) birikmalari;
3. Xromatlar va dixromatlar;
4. Xrom tuzlari.
5. Marganes (II, III, IV, VI, VII) birikmalari;
6. Manganat va permanganatlar;
7. Marganes tuzlari.

Mavzuning talaba mustaqil o'zlashtirishi lozim bo'lgan qismlari:

1. Xrom va marganes birikmalarining oksidlanish-qaytarilish xossalari;
2. 6-7 guruh elementlari (xrom va marganes birikmalari) hamda ularning farmatsiyadagi ahamiyati.

24



ХРОМ

Cr

51,9961

25



Mn

54,9380

МАРГАНЕЦ

ASOSIY ADABIYOTLAR:

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Periodic table of the elements

group	1*	2											13	14	15	16	17	18
1	1 H	2											5 B	6 C	7 N	8 O	9 F	10 Ne
2	3 Li	4 Be											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
3	11 Na	12 Mg	3	4	5	6	7	8	9	10	11	12	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
6	55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
7	87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
lanthanoid series	6	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu			
actinoid series	7	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr			

*Numbering system adopted by the International Union of Pure and Applied Chemistry (IUPAC).

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VI guruh elementlari

Kattaliklar	Cr	Mo	W
Atom massa	52,01	95,95	183,92
El.formulasi	$3d^5 4s^1$	$4d^5 5s^1$	$5d^4 6s^2$
Atom radiusi, nm	0,127	0,139	0,140
Ion radiusi (Me^{+6}), nm	0,035	0,065	0,069
Ionlanish energiyasi	6,8	7,10	8,0
Suyuqlanish harorati, °C	1875	2620	3380
$M \rightarrow Me^+$	7,2	10,2	19,3
Yer qobog'ida, %	$8 \cdot 10^{-2}$	$3 \cdot 10^{-4}$	$1 \cdot 10^{-4}$

Tabiatda tarqalishi



Xromli temirtosh -
 $\text{Fe}(\text{CrO}_2)_2$



Xromli oxra - Cr_2O_3



Molibdenit - MoS_2



Krokoit - PbCrO_4
(1766-yil. I.G. Leman tomonidan
kashf etilgan)



Sheelit - CaWO_4



Volframat -
 $(\text{Fe}, \text{Mn})\text{WO}_4$

H_2CrO_4 va $H_2Cr_2O_7$ ning tuzlari kuchli oksidlovchilar.

$Cr^{+6}-Mo^{+6}-W^{+6}$ qatorida barqarorlik ortadi, oksidlovchilik xossasi kamayadi. $H_2CrO_4-H_2MoO_4-H_2WO_4$ qatorida kislota kuchi kamayadi.

Tabiatda Cr - 4, Mo - 7, W - 5 izotoplari uchraydi.

Metallar hajmiy markazlashgan kub panjarada kristallanadi. K.s.=8

XROM

Vokelen tomonidan $PbCrO_4$ tarkibidan Cr ajratib olingan. “Xrom” so’zi “rangli” ma’nosini beradi. Oksid pardaga ega, passiv element.

Juda qattiq ($\delta=7,2 \text{ g/sm}^3$; suyuqlanish h. 1890°C , qayn.h $=2430^\circ\text{C}$), oq yaltiroq metall. Cr +2, +3, +6 o.d. ega.

Kons. HNO_3 yoki (HNO_3+3HCl) Cr ni passivlaydi;

O_2 va namlik Cr ga ta’sir etmaydi.



Texnikada:

Tarkibida 1-2% Cr bo’lgan po’lat juda qattiq va mustahkam bo’ladi. Tarkibida 2% Cr tutgan po’lat korroziyaga uchramaydi. Qotishmalari Cr - nixrom, xromal.

Cr ning olinishi va xossalari:

Passiv. Cr qimmatbaho metallarga o'xshaydi.



Sanoatda: Sanoatda xrom elektr pechlarida uglerod (II) oksidi bilan qaytarilib olinadi:



Qzidirilganda S, Si va Br_2 bilan:



Qizdirilganda, xrom kukuni suv bilan ta'sirlashadi:



Suyultirilgan HCl va H_2SO_4 +3 tuzlari:



Cr (II) birikmalari:

Cr^{2+} - beqaror.

CrO – qora kukun.



Cr^{2+} kislorod ishtirokida Cr^{3+} gacha oksidlanadi:



$\text{Cr}(\text{OH})_2$ – sariq rangli.

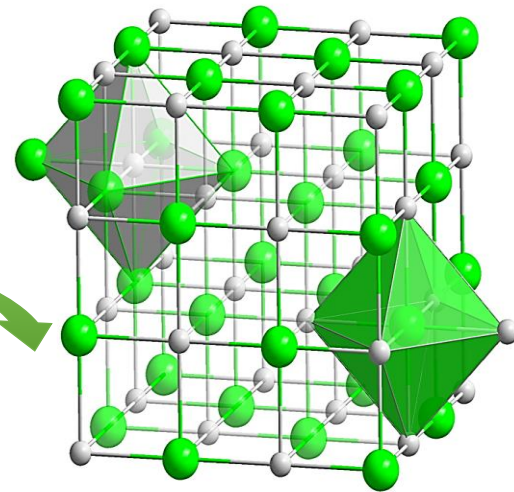
$\text{Cr}(\text{OH})_2$ uning tuzlariga ishqor ta'sir ettirib olinadi:



CrCl_2 – rangsiz kristall, suvda eriydi.

Eritmada havo rangli $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ akva kompleks.

Eng barqaror birikmasi $\text{Cr}(\text{CH}_3\text{COO})_2$.



Cr (III) birikmalari:

Cr³⁺ barqaror.

Cr₂O₃ – xromli oxra, yashil, suy. h. 2265°C.

Suvda, kislotalar va ishqorlarda erimaydi.

Xrom (III) oksidi olish uchun, bixromatlar uglerod yoki oltingugurt bilan qaytariladi:



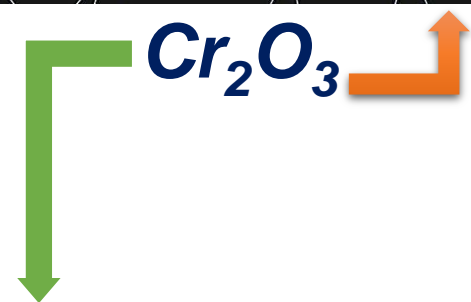
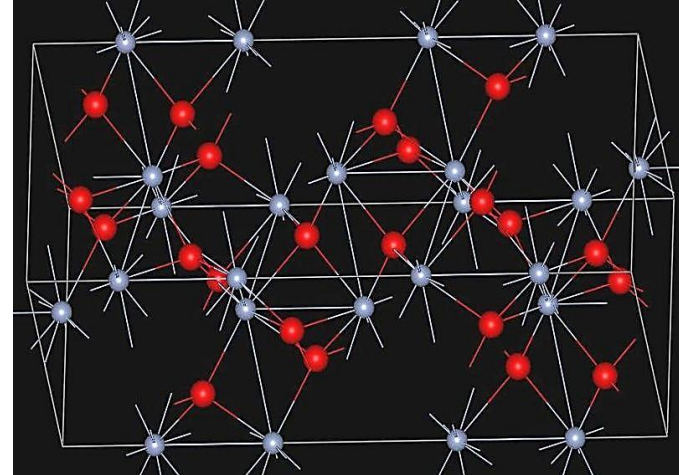
Dixromatlarni parchalab:



Cr₂O₃ pirosulfatlar bilan:



Cr (III) gidroksid olinishi va xossalari:



Cr (III) birikmalari:

Cr (III) birikmalari teri (charm) ni xromlash uchun ishlatiladi.

$HCrO_2$ – metaxromit kislota va uning tuzlari:



H_3CrO_3 – ortoxromitlar, faqat tuzlar holida olingan:



$Cr(OH)_3$ – ishqoriy muhitda Cr^{+6} birikmalariga o'tadi:



$Na_3[Cr(OH)_6]$ o'rniga ba'zan: $Cr(OH)_3$, $CrCl_3$, $NaCrO_2$, $Cr_2(SO_4)_3$.

Oksidlovchilar sifatida: Cl_2 , I_2 , $NaClO_3$, $NaNO_3$, H_2O_2 .

Bixromatlar PbO_2 , $KMnO_4$, $NaBiO_3$ ishtirokida kislotali muhitda:

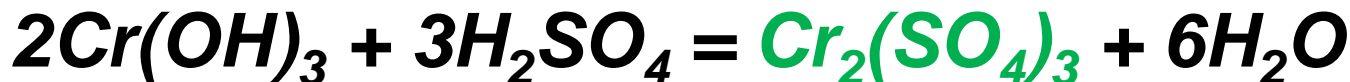


Cr^{3+} kationi ko'k rangli:



(CrO_2^-) anioni yashil rangli,
(natriy xromit, kaliy xromit).

$Cr(OH)_3$ - amorf birikma:



Xrom (III) tuzlari girolizi kation mexanizmi bo'yicha:

[Cr_2S_3 – qora kristall modda].

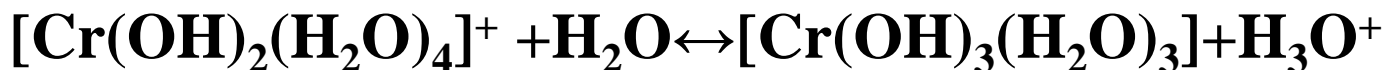
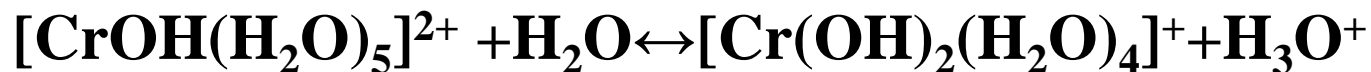


to'la gidroliz:



Xrom (III) tuzlari gidrolizi

Gidroliz jarayoni kation bo'yicha boradi:



To'la gidroliz:



Cr_2S_3 – qora kristall modda:



To'la gidroliz. Eritmada mavjud emas

Cr^{3+} kristallogidratlari - $CrCl_3 \cdot 6H_2O$;

$K_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$;

$Cr_2(SO_4)_3 \cdot 18H_2O$;

$(NH_4)_2SO_4 \cdot Cr_2(SO_4)_3 \cdot 24H_2O$.

Xrom (III) birikmalari k.s. 6 ga teng kompleks birikmlar h.q-di:



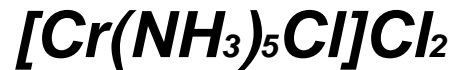
ko'k-binafsha



och-yashil



tim-yashil



Xrom (IV) birikmalari:

6-guruh elementlari uchun MeO_2 rutil tuzilishga ega. Qora xrom (IV) oksida metall o'tkazuvchanlikka ega, ferramagniten elektronikada qo'llaniladi. Metall dioksidlar kislorod ishtirokisiz xrom (VI) birikmalar parchalanishida oraliq birikmalar sifatida

hosil bo'ladi: **$3(NH_4)_2Cr_2O_7 = 6CrO_2 + 2N_2 + 9H_2O + 2NH_3$**

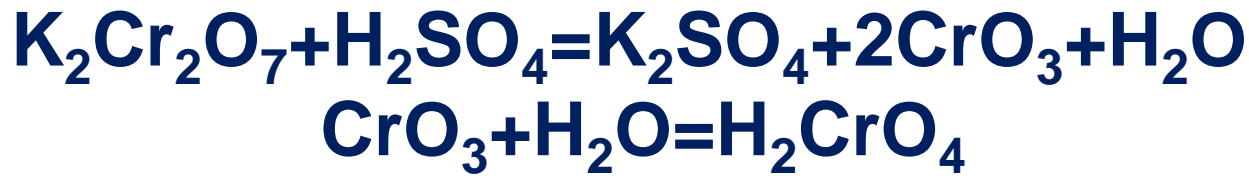


Xrom (III) nitrat parchalanishi ($400^\circ C$): $2Cr(NO_3)_3 = 2CrO_2 + 6NO_2 + O_2$

Xromil xlorid pirolizi ($360^\circ C$): $CrO_2Cl_2 = CrO_2 + Cl_2$

Xrom (VI) birikmalari:

CrO_3 – qizil rangli ignaga o'xshash kristallar. (suy.h. 197°C).
Suvda yaxshi eriydi.



O'rtacha kuchli kislota.

H_2CrO_4 va $\text{H}_2\text{Cr}_2\text{O}_7$:



Suyultirilganda muvozanat H_2CrO_4 tomon siljiydi.

Olinishi:



CrO_3

Xromat va **dixromat** kislota bir-biriga o'tishi mumkin. Agar **natriy xromatiga** kislota qo'shilsa, muvozanat o'ngga siljiydi. Agar **natriy bixromatga** ishqor qo'shilsa, muvozanat chapga siljiydi:



$\text{K}_2\text{Cr}_2\text{O}_7$ oksidlovchi



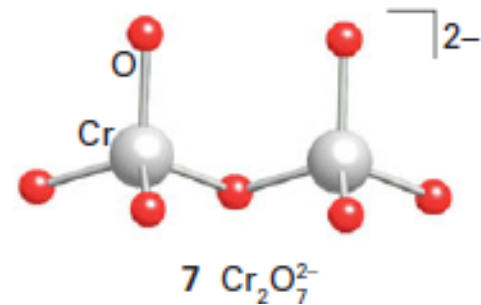
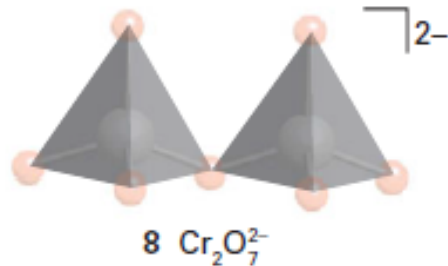
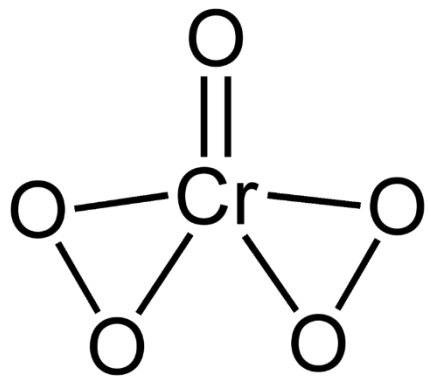
H_2S o'rniga: KJ , Na_2SO_3 , NaNO_2 .

Xromatlar olinishi (CrO_4^{2-} sifat reaksiya):



H_2O_2 o'rniga: NaNO_3 , KClO_3 .





Bixromatlar PbO_2 , $KMnO_4$, $NaBiO_3$ ishtirokida olinadi:



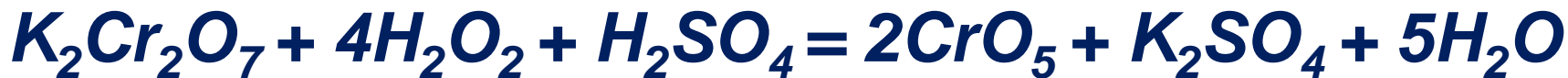
Xrom perokso birikmalari ma'lum. Yoki peroksit kislotalar:



$H_2Cr_2O_{12}$ - efirda barqaror ko'k rangli.

H_3CrO_8 - qizil rangli.

efirda



Binafsha (siyoh) rangga bo'yalgan ($Cr_2O_7^{2-}$ sifat reaksiya).

K_2CrO_4 kaliy xromat suvsiz kristallanadi.

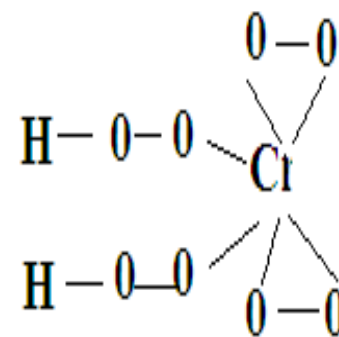
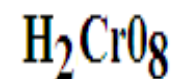
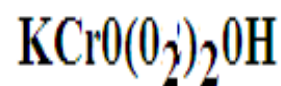
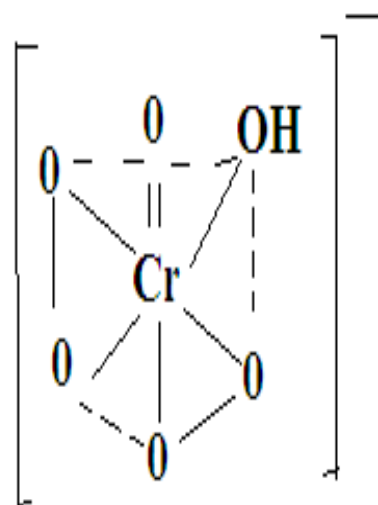
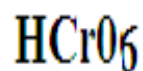
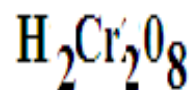
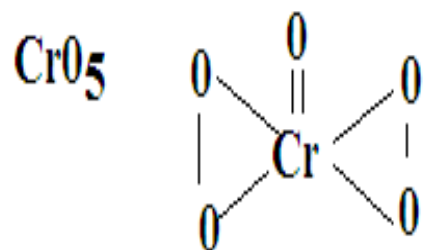
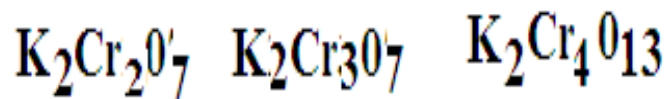
Xrom birikmasi CrO_2Cl_2 – to'q-qizil suyuqlik:



Qiyin eriydigan tuzlari $PbCrO_4$ va $BaCrO_4$ – sariq rangli.

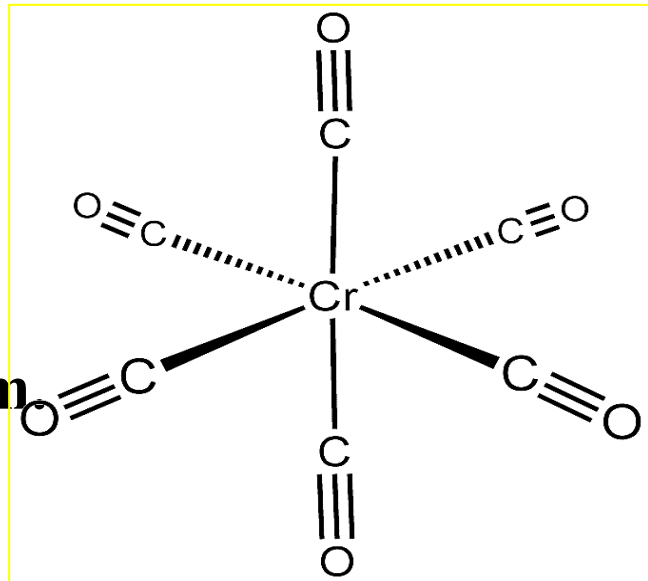
Polimer oksianionlar

Полимерные оксианионы
Polimer oksianionlar



Cr, Mo va W

CrF₆, MoF₆ va WF₆ – tuzlari ham ma'lum.



Geksakarbonilli kompleks **[E(CO)₆]**.

Geksakarbonil xrom **[Cr(CO)₆]** – rangsiz kristall.

MoO₃ – oq-sarg'ish, suvda kam eriydi (suy.h. 795°C).

Bu oksid suvda eriganda undan molibdatlar olinadi.

Molibdatlarga nitrat kislota ta'sir ettirilsa, **H₂MoO₄** ning ignasimon kristallari hosil bo'ladi.

FeWO₄ va MnWO₄, CaWO₄ – volframat kislota tuzlari.

WF₆, WO₃, WCl₆ – sof holda barqaror moddalardir.

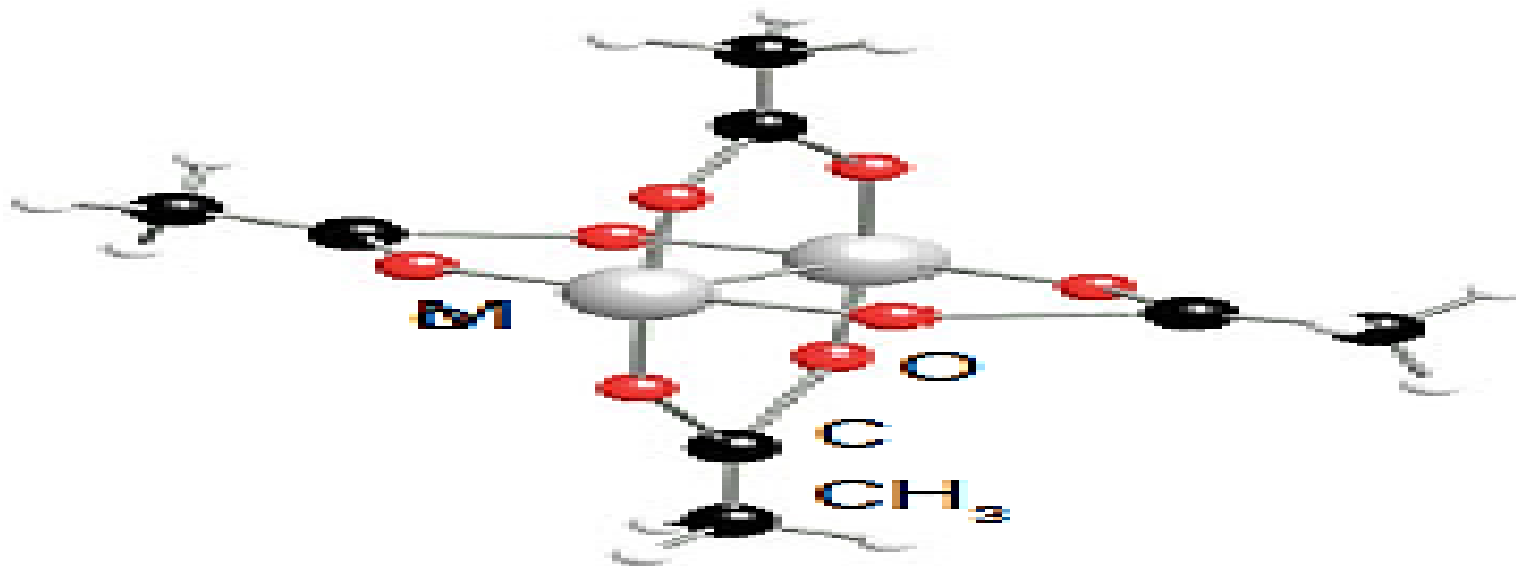
Shu bilan birga xromning kompleks birikmasi ham olingan

Na₂[Cr(CO)₅], bunda xromning oksidlanish darajasi -2 ga teng.

Na₄[Cr(CO)₄] kompleks birikmada xromning oksidlanish darajasi -4 ga teng.

$\text{Cr}(\text{C}_2\text{O}_4)_3 \cdot 6\text{H}_2\text{O}$ – **to'q qizil** va juda gigroskopik kristallar bo'lib, suvda va spirtida yaxshi eriydi. Bu tuz 125°C gacha qizdirilsa, erimaydigan **yashil** kukun cho'kadi. Agar oksalat ionlari eritmada mo'l miqdorda bo'lsa, **to'q-yashil**, deyarli qora rangli $\text{K}_3[\text{Cr}(\text{C}_2\text{O}_4)_3]$ turdagi kompleks kristallar hosil bo'ladi.

Geksakarbonilmolibdendan metall-metall kompleks birikmalarini olish mumkin:



Qo'llanilishi: Cr (III) va (VI) birikmalari zaharli.

Inson uchun letal doza $K_2Cr_2O_7 - 0,3$ g.

Terida dermatit hosil qiladi. $K_2Cr_2O_7$ - charm, to'qimachilik, bo'yoq va farmatsevtika sanoatida qo'llaniladi. Xrom oqsillar va nuklein kislotalar tarkibida ham uchraydi. Xrom tanadagi glyukozaning so'rilishi uchun kerak. Yurak-qon tomir kasalliklari, surunkali xoletsistit va jigar sirozida xrom etishmovchiligi aniqlangan. Qo'rg'oshin xromati (sariq toj) bo'yoqlar tayyorlash uchun ishlatiladi.

$K_2Cr_2O_7$ kons. H_2SO_4 teng hajmdagi eritmasi – xrompik deyiladi. Aralashma kuchli oksidlovchi bo'lib, u b/n idishlar yuviladi.

DF-XI bo'yicha vodorod peroksid (H_2O_2) ning haqiqiyiligini aniqlash:



Biperoksixrom kislota (H_2CrO_6) yoki peroksixrom kislotasi ($HCrO_5$) ko'k-siyoh rangli. Mo-ksantinoksidaza va reduktaza fermentlari tarkibiga kiradi. Mo-elementi PO_4^{3-} ionini aniqlashda reagent sifatida foydalaniladi.

Test:

1. Cr elementi kim tomonidan kashf etilgan?

A) Leman; B) Vokelen; S) Lavuaze; D) Lomonosov.

2. Krokoit mineralidan Cr ni dastlab kim ajratib olgan?

A) Leman; B) Vokelen; S) Lavuaze; D) Lomonosov.

3. Xrom (III) sulfatdan kaliy dixromat olish uchun qanday oksidlovchi moddalardan foydalanish mumkin?

A) $\text{Br}_2 + \text{KOH}$; B) $\text{H}_2\text{O}_2 + \text{NaOH}$; S) $\text{PbO}_2 + \text{HNO}_3$ D) $\text{J}_2 + \text{H}_2\text{SO}_4$

4. 6-guruhga qaysi elementlar kiradi?

A) Cr, Mo, W B) Cr, Fe, W S) Mo, Co, W D) Cr, Ni, Mo.

5. Metaxrom va ortoxrom kislotalarning tuzlarini ko'rsating.

A) K_2CrO_4 , $\text{Na}_2\text{Cr}_2\text{O}_7$

S) KCrO_2 , K_2CrO_4

B) K_2CrO_4 , K_3CrO_3

D) KCrO_2 , K_3CrO_3

6). Quyidagi qatorda chapdan o'ngga qarab barqarorlik qanday o'zgaradi? $\text{Cr}^{+6} \rightarrow \text{Mo}^{+6} \rightarrow \text{W}^{+6}$?

A) ortadi

B) kamayadi

S) o'zgarmaydi

D) avval ortib, keyin kamayadi

7). Quyidagi qatorda chapdan o'ngga qarab oksidlovchilik xossalari qanday o'zgaradi?



A) avval ortib, keyin kamayadi

B) ortadi

S) o'zgarmaydi

D) kamayadi

8). Quyidagi oksidlanish darajasining qaysi bir Cr uchun barqaror? A) +6 B) +3,+6 S) +4,+5 D) +2,+3,

9). Cr ning qaysi oksidi barqaror?

A) CrO

B) CrO₂

S) Cr₂O₃

D) CrO₃

10). H₂O₂ eritmasini haqiqiylikini aniqlash uchun quyidagi moddalardan qaysi biridan foydalaniladi?

A) K₂CrO₄;

B) K₃CrO₃;

S) Na₂Cr₂O₇;

D) NaCrO₂

7 guruh elementlari (n-i) d^5ns^2 .

Asosiy kattaliklar	Mn	Tc	Re
Atom massa	54,93	[99]	186,2
El.formula	$3d^54s^2$	$4d^55s^2$	$5d^56s^2$
Atom radius, nm	0,13	0,136	0,137
Ionlanish energ. M→Me ⁺ ,ev	7,4	7,28	7,87
Suy.h.,°C	1244	2127	3180
Zichligi, g/cm ³	7,44	11,49	21,04
Yer qobig'idagi tarqalishi, %	$9 \cdot 10^{-2}$	-	$1 \cdot 10^{-7}$

${}_{25}\text{Mn}$, ${}_{43}\text{Tc}$, ${}_{75}\text{Re}$, ${}_{107}\text{Bh}$. El.qobig'i $(n-1)d^5$. Re va Tc o'xshash. Mn barqaror birikmalari +2,+4,+7 o.d ega. Shu bilan birga Mn ning +3,+5,+6 birikmalari ham mavjud. Tc^{+7} va Re^{+7} birikmalari barqarordir.

Mn-Tc-Re qatorida faollik kamayadi.

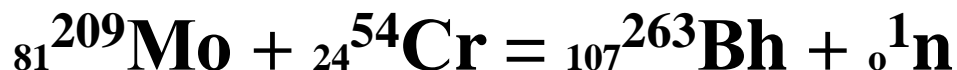
Mn ni 1774-yil Sheele kashf etgan. 1808-yil Jon toza Mn olishga muvaffaq bo'lgan. 1871-yil Tc ni D.I.Mendeleev **ekamarganes deb nomlagan**. Tc – 1937-yil olingan. Mo deutronlar bilan bombordimon qilinganda:



Tabiatda uchraydigan izotopi ${}_{25}^{55}\text{Mn}$ (100%).

Re - barqaror izotopga ega ${}_{75}^{185}\text{Re}$ (36,07%)

Tc - 15 ta izotopi bor. ${}_{43}^{99}\text{Tc}$ izotopi barqaror (yarim yemirilish davri $2 \cdot 10^5$ yil.).



Mn ning tabiatda tarqalgan birikmalari



Albandin-MnS



**Braunit-
 $Mn_2O_3 \cdot MnSiO_3$**



Pirollyuzit- MnO_2



Gausmanit - Mn_3O_4



Gauerit - MnS_2



Manganit - $MnO(OH)$



Rodoxrozit – $MnCO_3$



Purpurit – $MnPO_4$



Fizik xossalari. Mn - qattiq, mo'rt, xossaloriga ko'ra Fe o'xshash metall. **Suyuqlanish.h. $1245^{\circ}C$.** Mn 4 xil allotropik modifikatsiyaga ega:

- 1) $\alpha - Mn (<727^{\circ}C)$
- 2) $\beta - Mn (727-1100^{\circ}C)$
- 3) $\gamma - Mn (1100-1137^{\circ}C)$
- 4) $\delta - Mn (>1137^{\circ}C)$

Mn – qaytaruvchi: $Mn + CuSO_4 = MnSO_4 + Cu$

Olinishi: $MnO_2 + 2C = 2CO + Mn$

Alyuminotermiya usuli: $3MnO_2 + 4Al = 2Al_2O_3 + 3Mn + 391 \text{ kkal}$

Kremniytermiya usuli: $MnO_2 + Si = Mn + SiO_2$

Mn tuzlari eritmalarining elektrolizi:

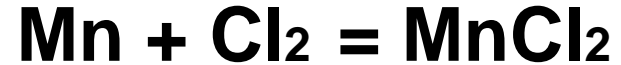
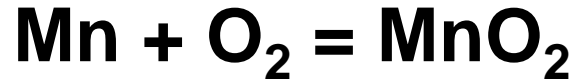


Kimyoviy xossalari

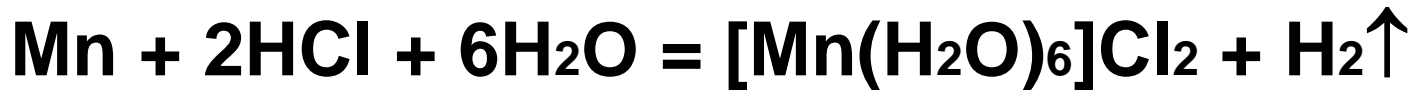
Mn – barqaror, maydalansa oson oksidlanadi.

Al, Sb, C lar bilan ferromagnet qotishmalar hosil qiladi.

Qizdirilganda galogenlar hamda S, N, P, C, Si lar bilan:

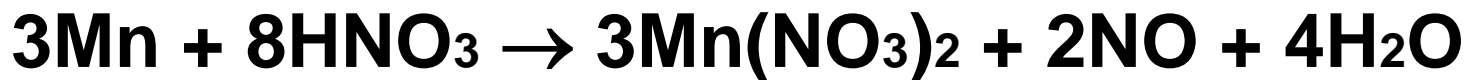


Mn - N, P va Si lar ishtirokida o'zgaruvchan tarkibli birikmalar: MnP, MnP₃, Mn₂P, Mn₃P, Mn₃C, Mn₅C₂, Mn₁₅C₄, Mn₇C₃, Mn₈C₇, MnSi, Mn₃Si, Mn₅Si hosil qiladi



Eritmada akvakomplekslar hosil bo'ladi.

Kons. H₂SO₄, HNO₃ qizdirilganda Mn bilan ta'sirlashadi:

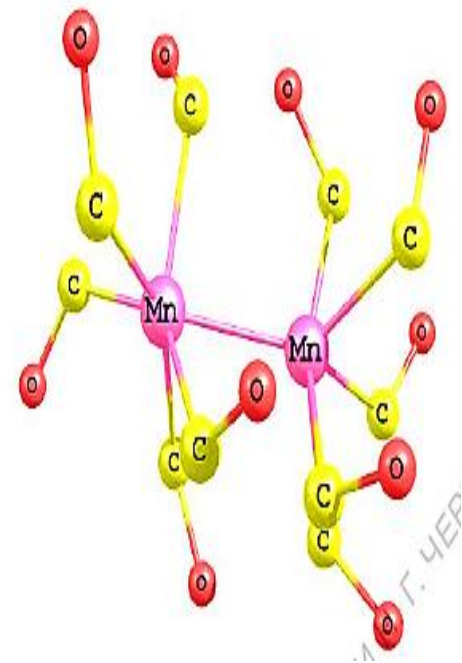


suyultirilgan.

Mn ning neytral kompleksi

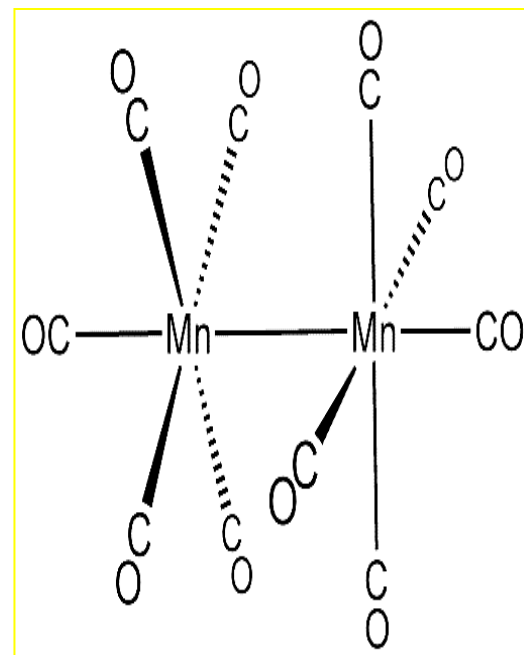
$[\text{Mn}_2(\text{CO})_{10}]$ formulaga ega.

$[\text{Mn}_2(\text{CO})_{10}]$ - sariq qattiq modda.
Suyuq.h. 155°C .



Nevil Vinsent Sejvik (Ingliz olimi)

qoidasi metallokompleksning
barqarorligi, 18 ta elektron valent
qobiqda mavjudligi bilan
tavsiflanadi.

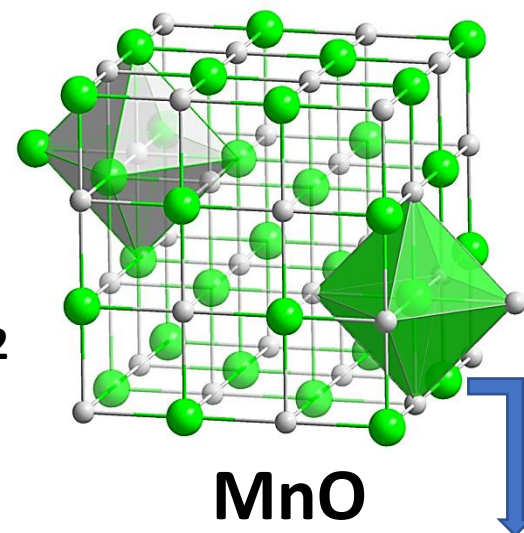


Mn birikmalari

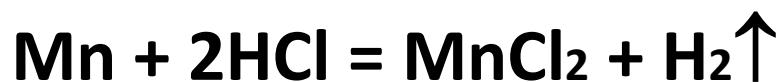
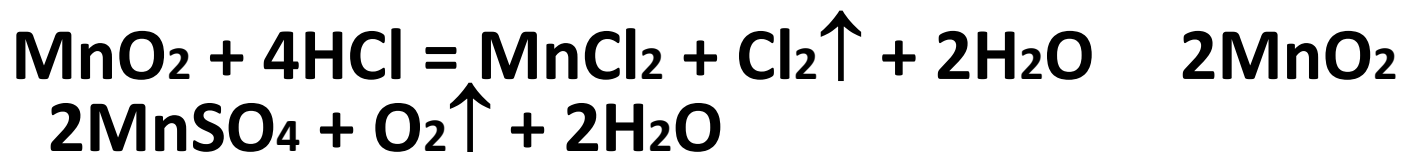
MnO; Mn₂O₃ asosli, MnO₂ amfoter, MnO₃; Mn₂O₇ kislotali.

Mn(OH)₂ Mn(OH)₃ Mn(OH)₄ H₂MnO₄ HMnO₄

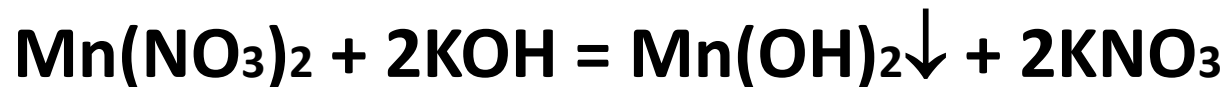
Mn (II) MnO – yashil kukunsimon modda, suy.h. 1780°C.



Mn⁺² birikmalarining olinishi:



Mn (II) birikmalari



Oq cho'kma, qo'ng'ir rangga o'tadi:



Qo'sh tuzlari: $\text{K}_2\text{SO}_4 \cdot \text{MnSO}_4 \cdot 6\text{H}_2\text{O}$

$\text{Al}_2(\text{SO}_4)_3 \cdot \text{MnSO}_4 \cdot 24\text{H}_2\text{O}$ - matolar uchun bo'yoq.

Erimaydigan birikmalar:

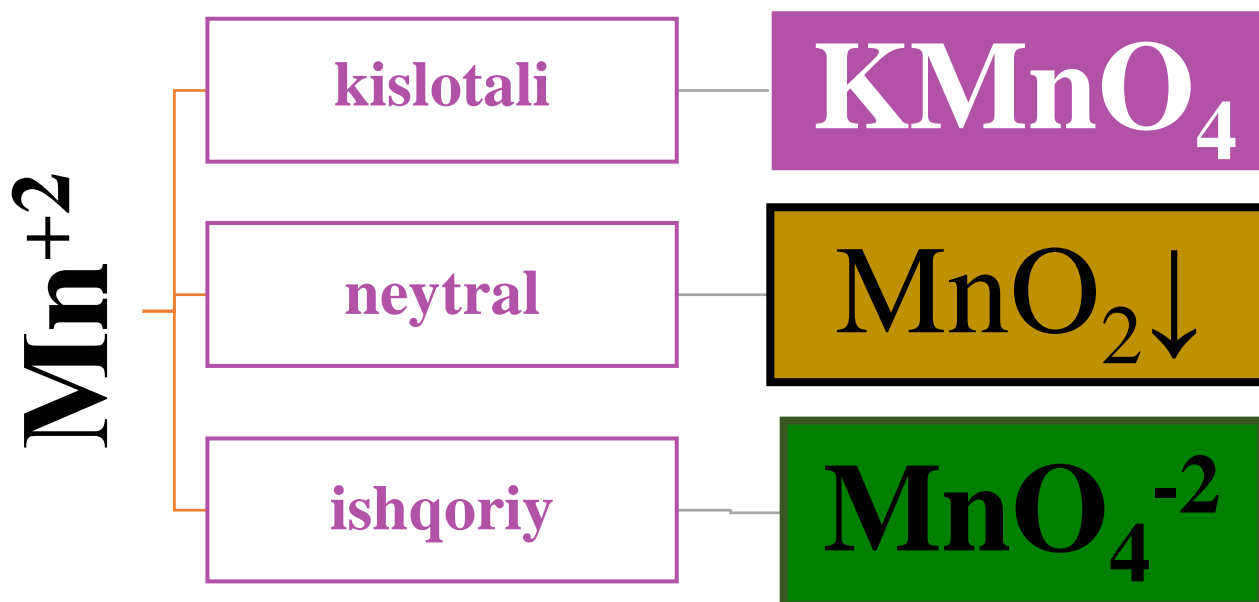
MnS , MnF_2 , $\text{Mn}_3(\text{PO}_4)_2$, MnCO_3

Akva komplekslar: $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$

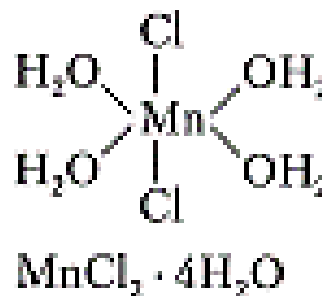
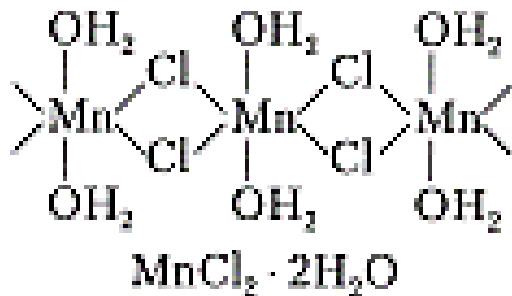
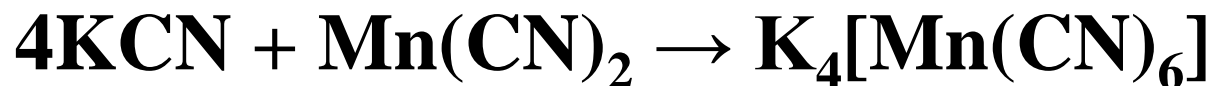
Anion komplekslar: $\text{K}_4[\text{Mn}(\text{OH})_6]$, $\text{Ba}_2[\text{Mn}(\text{OH})_6]$

$\text{K}_4[\text{Mn}(\text{CN})_6]$, $\text{K}_4[\text{MnF}_6]$, $\text{K}_2[\text{MnCl}_6]$ – bu komplekslar eruvchan. $4\text{MnO}_2 = 2\text{Mn}_2\text{O}_3 + \text{O}_2$ $3\text{MnO}_2 = \text{Mn}_3\text{O}_4 + \text{O}_2$

Eritma muhitining Mn^{+2} oksidlanishiga ta'siri:



Mn (II) koordinatsion birikmalari



Bu o'zgarish qaysi eritma muhitida sodir bo'ladi?



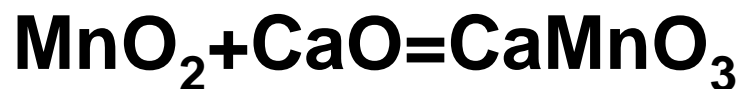
Mn (III) birikmalari:



CsMn(SO₄)₂ · 12H₂O - barqaror birikma

Mn (IV) birikmalari:

MnO₂ – suvda erimaydi,
Kislotalar ta'siriga chidamli:



H₄MnO₄ (ortomanganatlar),

H₂MnO₃ (metamanganatlar) tuzlari.



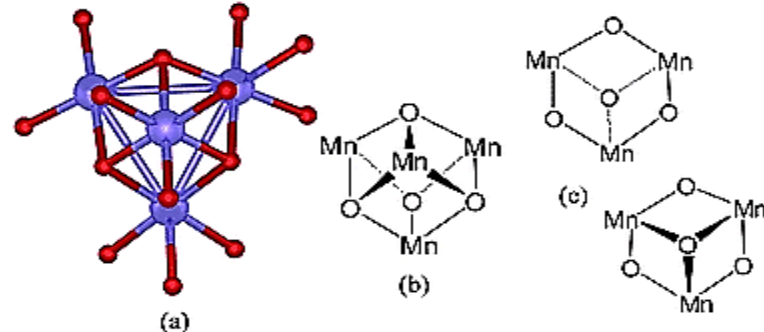
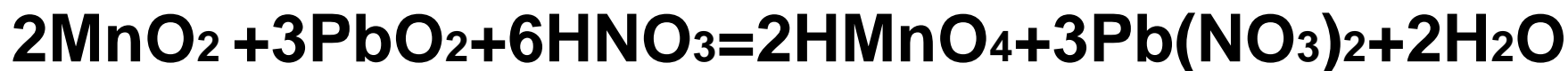
Oksidlovchi sifatida:



Qaytaruvchi sifatida:



Kislotali muhitda oksidlanishi:



Mn V va VI birikmalari:

Mn⁺⁵ birikmalari:

H₃MnO₄ - beqaror, olinmagan.

Na₃MnO₄ va **K₃MnO₄** tuzlari olingan.

Mn⁺⁶ birikmalari:

MnO₃ va **H₂MnO₄** olinmagan, beqaror.

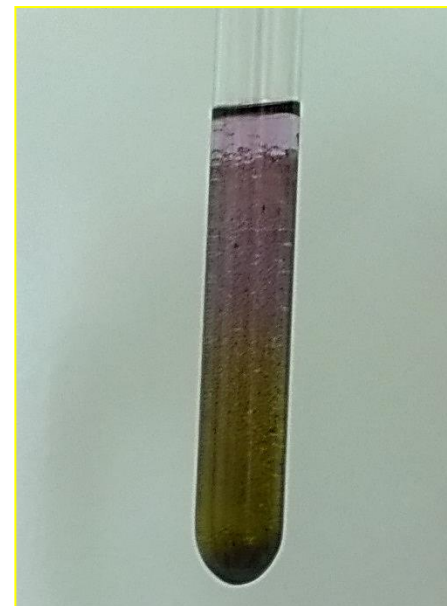
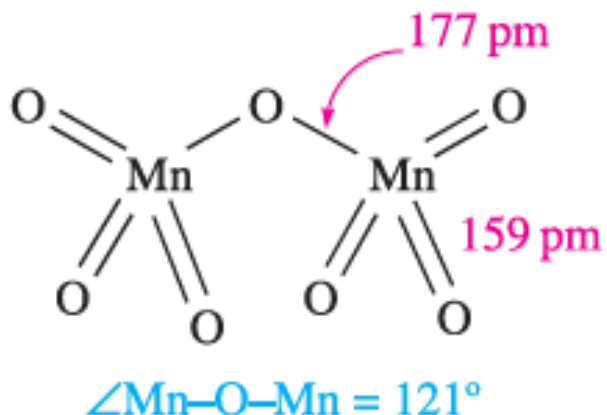
Manganatlarning olinishi:



Neytral va kislotali muhitda disproporsiyalanish reaksiyalari sodir bo'ladi:



Mn (VII) birikmalari:



Mn^{+7} birikmalari:

Mn_2O_7 - quyuuq-yashil suyuqlik, suyuql.h. $5,9^\circ\text{C}$.

Yog'simon suyuqlik.



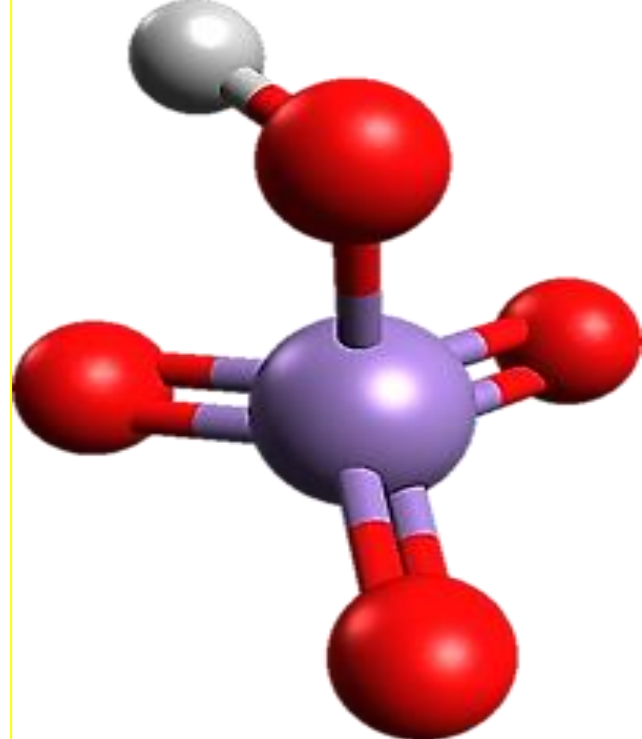
Kislota va uning tuzlari eritmasi pushti rangli.

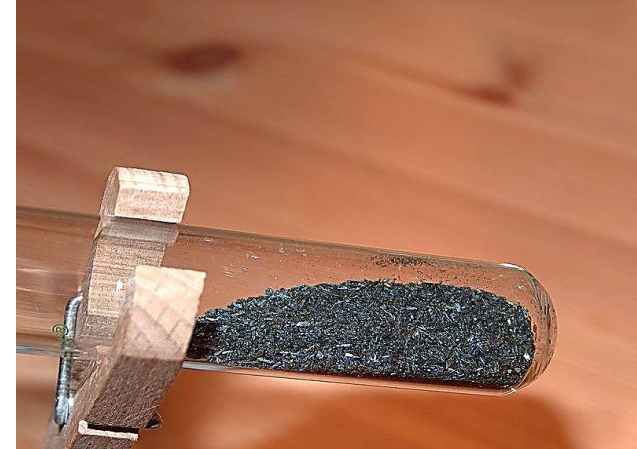
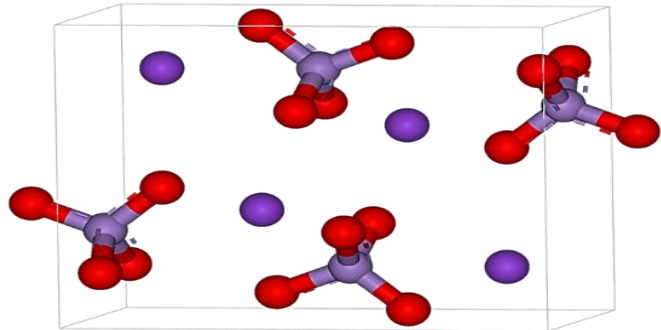
KMnO_4

HMnO_4 – kuchli kislota,
20% eritmada, 0,1 n $\alpha=93\%$.

Kristall KMnO_4 ni 2-4 tomchi kons. H_2SO_4 bilan shisha tayyoqcha yordamida aralashtirilganda hamda spirt yoki efir bilan namlangan paxtaga tekkizilganda, u darhol yonib boshlaydi.

KMnO_4 - qora-binafsha kristall, suvda pushti rang hosil qiladi.





KMnO₄ - 200°C parchalanadi:



Laboratoriyada olinishi:



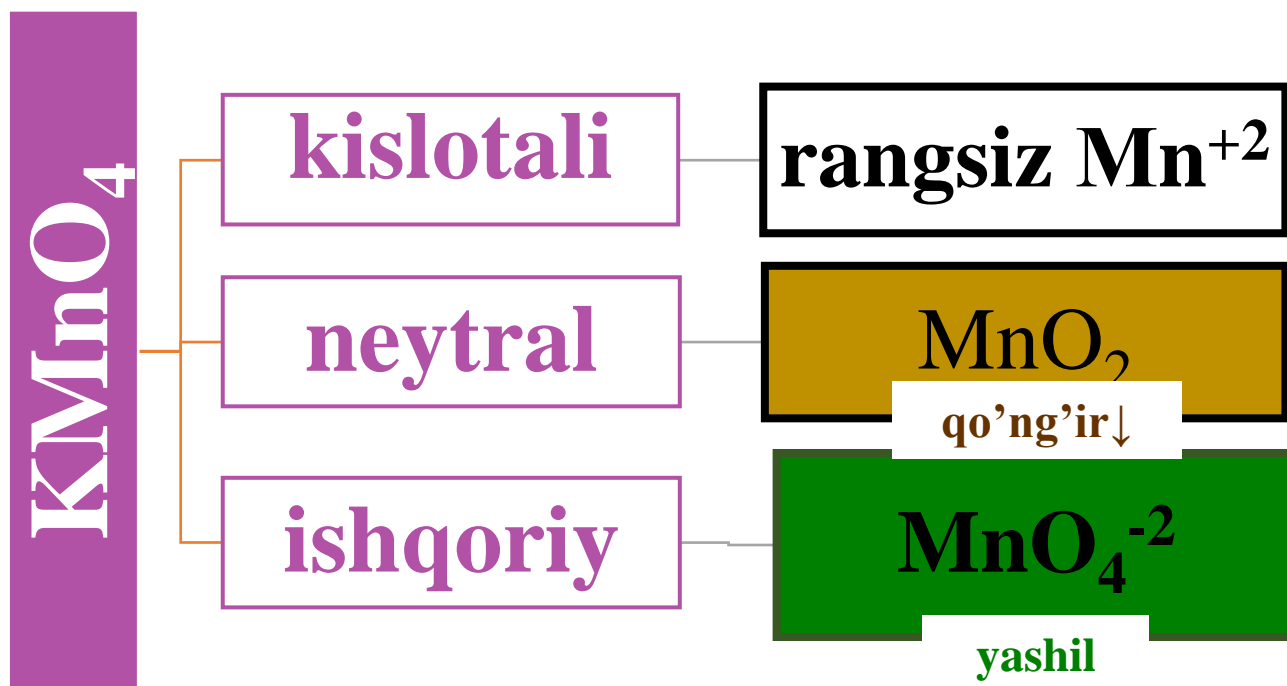
KMnO₄ - gazlamalarni oqartirish uchun va oksidlovchi vosita sifatida.

Oksidlovchilik xossalari:



Na₂SO₃ o'rniga: KI, Na₂S₂O₃, KNO₂, H₂S.

Eritma muhitining KMnO_4 qaytarilishiga ta'siri:



Texnesiy va reniy

Re – 1925-yil kashf etilgan. CuReS_4 - jezkazganit.

Tc va Re (II) birikmalari mavjud emas.

Tc va Re - MeO_2 , MeCl_4 , K_2MeO_3 , K_2MeF_6 ,

Tc (IV) birikmalari barqaror.

Re_2O_3 va ReO_2 qora rangli. ReO_3 – qizil rangli (qay.h. 160°C). Re_2O_7 – sariq rangli (qay.h. 296°C).

Reniy kislota (HReO_4).

Tc va Re – nitrat kislota ishtirokida oksidlanadi:

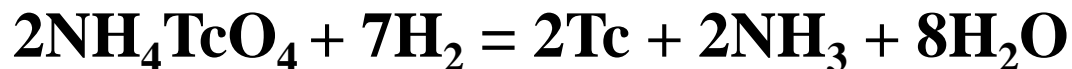
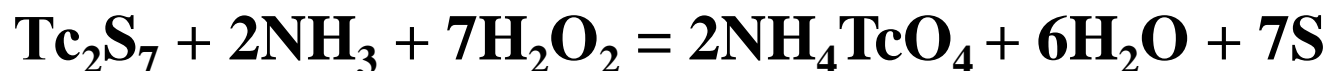
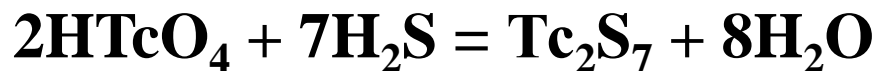
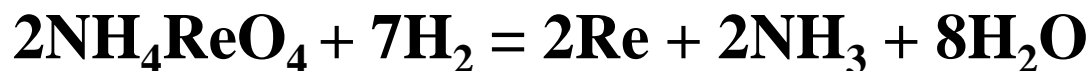
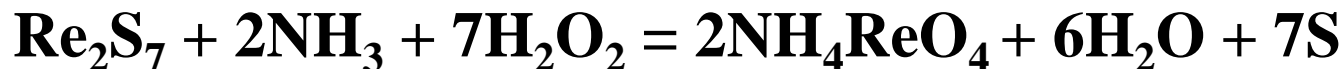
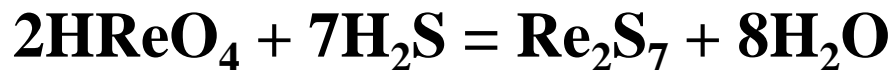


Re_2O_7 va Tc_2O_7 - oddiy moddalarning oksidlanishi natijasida olinadi.

HMnO_4 - HTcO_4 - HReO_4 - kislotalar kuchi kamayadi.

MnO_4^- - pushti, TcO_4^- - pushti, ReO_4^- - rangsiz.

Texnesiy va reniy olinishi:



Xossalari. Nitrat kislota bilan o'zaro ta'sirlashganda kislota hosil bo'ladi:



Ammoniy pertexnatning parchalanishi bilan Re va Tc dioksidlari olinadi:

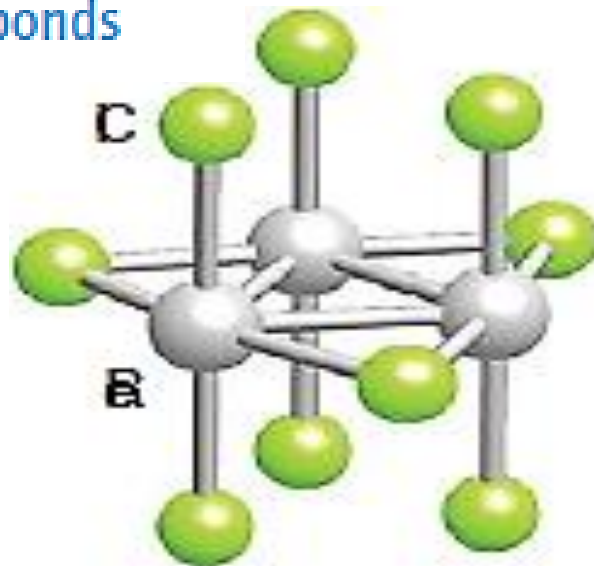
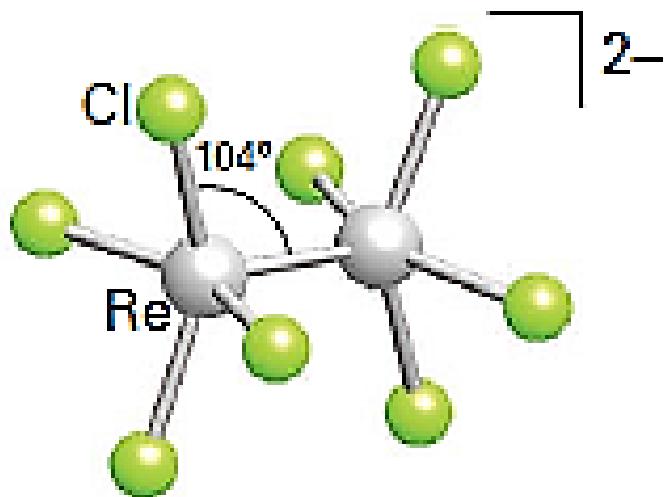


(u (oksid) disproporsiyalanish reaksiyasiga uchraydi).

7 guruh elementlarining galogenidlari

Степень окисления	MnX _n	TcX _n	ReX _n
+2	MnF ₂ , MnCl ₂ , MnBr ₂ , MnI ₂	—	—
+3	MnF ₃ , MnCl ₃	—	Re ₃ Cl ₉ , Re ₃ Br ₉ , Re ₃ I ₉
+4	MnF ₄ , MnCl ₄	TcCl ₄	ReF ₄ , ReCl ₄ , ReBr ₄ , ReI ₄
+5	—	TcF ₅	ReF ₅ , ReCl ₅ , ReBr ₅
+6	—	TcF ₆	ReF ₆ , ReCl ₆
+7	—	—	ReF ₇

(a) Metal–metal bonds



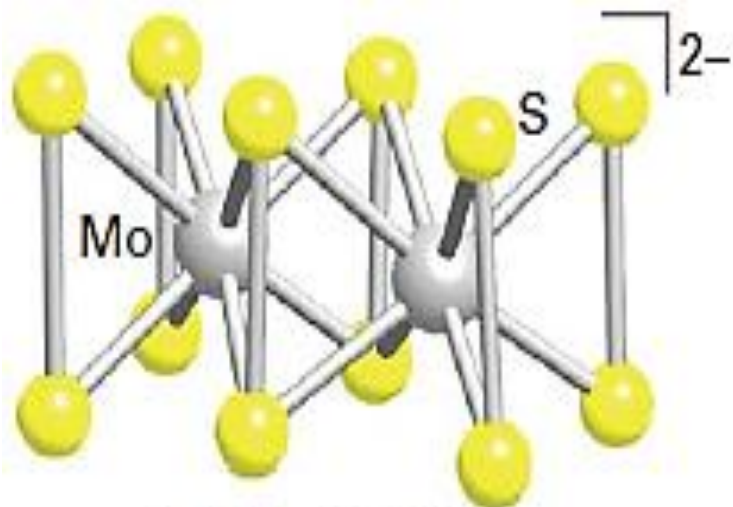
Texnesiy va reniyning gidridli komplekslari

Mn – vodorod bilan binar birikmalar hosil qiladi. Ushbu birikmalar o'zgaruvchan tarkibli bo'lib, xossalari to'liq o'rganilmagan. Texnesiy va reniyning yuqori oksidlanish darajasiga ega ionli gidridlari mavjud.

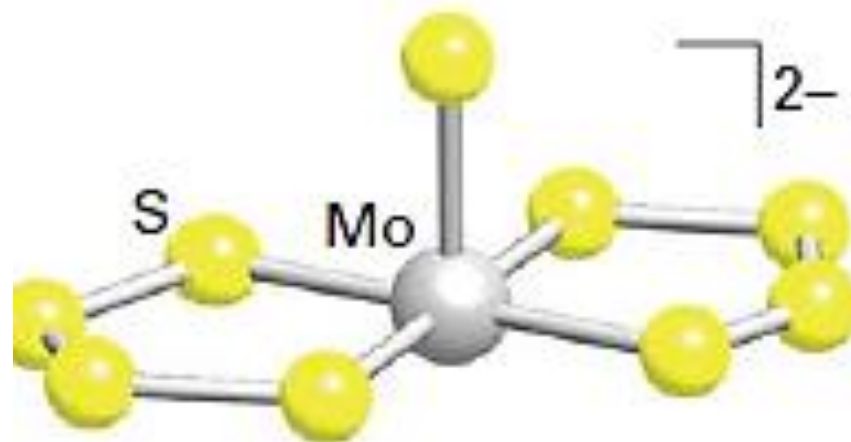
$\text{Na}_2[\text{ReH}_9]$ - nonagidridorenat (VII), reniy kislota tuzlarini etanoldagi natriy metali ishtirokida havosiz muhitda qaytarib olinadi:



Mahsulot suvda eriydi, biroq ishqorlar ta'siriga barqaror. $\text{Na}_2[\text{ReH}_9]$ – uchli trigonal prizma shakliga ega bo'lib, har bir to'rtburcha yuzida vodorod atomlari joylashgan. Reniy atomlari hamda prizma uchlaridagi vodorod atomlari orasidagi masofa 0,168 nm. Barcha Re-H bog'lari teng. Ular gidrid ionlarining reniyning bo'sh d-orbitallarini to'ldirishi va qoplashi natijasida hosil bo'ladi.



11 $[\text{Mo}_2(\text{S}_2)_6]^{2-}$



12 $[\text{MoS}(\text{S}_4)_2]^{2-}$

6-7 guruh elementlari eritmalarining ranglari



E'tiboringiz uchun raxmat!