

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

## **1-MA’RUZA:**

**DAVRIY JADVALNING 8-10 GURUH ELEMENTLARI.  
TEMIR, KOBALT VA NIKEL GURUHLARI**

**Ma’ruza mualliflari:**

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## ASOSIY ADABIYOTLAR:

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6. Шрайвер Д., Эткинс П.. Неорганическая химия. В 2-х т. Т 2/ Перевод с англ. А.И.Жирова, Д.О.Чаркина, С.Я. Истомина, М.Е.Тамм-Мир, 2004.-486 с.
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# REJA:

Mavzuning ma'ruza davomida yoritiladigan qismlari:

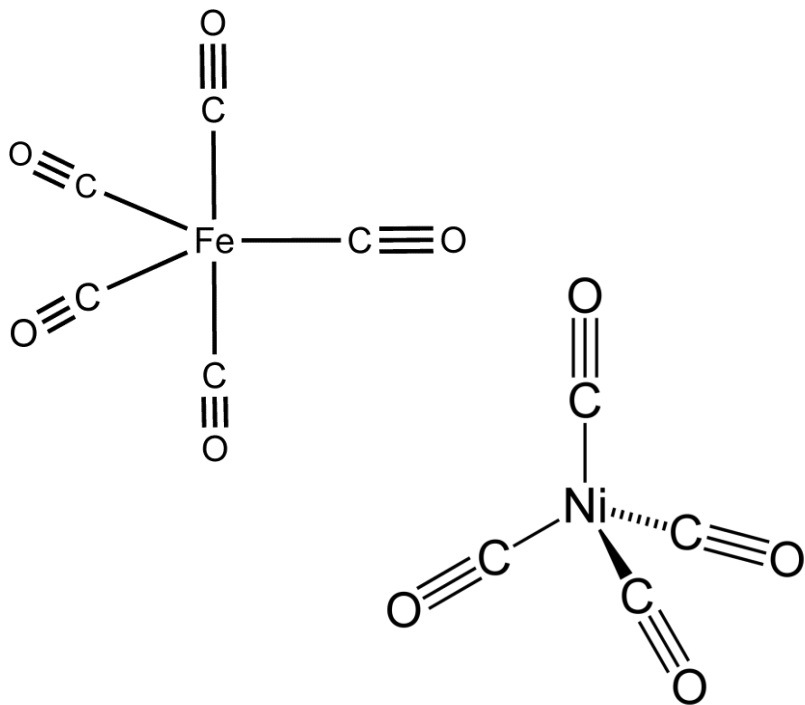
1. Guruhning umumiy xossalari;
2. Temir  $Fe^{+2}$  va  $Fe^{+3}$  birikmalari;
3. Temir  $Fe^{+6}$  va  $Fe^{+8}$  birikmalari;
4. Kobalt va nikel birikmalari, ularning xossalari;
5. Platina oilasi metallari xossalari.

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

1. Temir, kobalt va nikel olinishi va xossalari;
2. Temir, kobalt va nikel birikmalari va xossalari;
3. Temir, kobalt va nikel birikmalarining farmatsiyadagi ahamiyati.

# Bugun siz bilib olasiz!

Nima uchun Fe va Ni  
karbonillari farqli?



Pomadaga qaysi modda qizil  
rang beradi?



# Kimyoviy elementlar davriy jadvali

PERIODIC TABLE OF THE ELEMENTS

		Period 1																				18
		1.0079 1s <sup>1</sup>																				VIII
																						VIIA
Group	1	2											13	14	15	16	17	18				
	IA	IIA											IIIA	IVA	VA	VIA	VIIA	VIIIA				
2	3 Li lithium 6.94 2s <sup>1</sup>	4 Be beryllium 9.01 2s <sup>2</sup>											5 B boron 10.81 2s <sup>2</sup> 2p <sup>1</sup>	6 C carbon 12.01 2s <sup>2</sup> 2p <sup>2</sup>	7 N nitrogen 14.01 2s <sup>2</sup> 2p <sup>3</sup>	8 O oxygen 16.00 2s <sup>2</sup> 2p <sup>4</sup>	9 F fluorine 19.00 2s <sup>2</sup> 2p <sup>5</sup>	10 Ne neon 20.18 2s <sup>2</sup> 2p <sup>6</sup>				
3	11 Na sodium 22.99 3s <sup>1</sup>	12 Mg magnesium 24.31 3s <sup>2</sup>	3	4	5	6	7	8	9	10	11	12	13 Al aluminum 26.98 3s <sup>2</sup> 3p <sup>1</sup>	14 Si silicon 28.09 3s <sup>2</sup> 3p <sup>2</sup>	15 P phosphorus 30.97 3s <sup>2</sup> 3p <sup>3</sup>	16 S sulfur 32.06 3s <sup>2</sup> 3p <sup>4</sup>	17 Cl chlorine 35.45 3s <sup>2</sup> 3p <sup>5</sup>	18 Ar argon 39.95 3s <sup>2</sup> 3p <sup>6</sup>				
4	19 K potassium 39.10 4s <sup>1</sup>	20 Ca calcium 40.08 4s <sup>2</sup>	21 Sc scandium 44.96 3d <sup>1</sup> 4s <sup>2</sup>	22 Ti titanium 47.87 3d <sup>2</sup> 4s <sup>2</sup>	23 V vanadium 50.94 3d <sup>3</sup> 4s <sup>2</sup>	24 Cr chromium 52.00 3d <sup>4</sup> 4s <sup>1</sup>	25 Mn manganese 54.94 3d <sup>5</sup> 4s <sup>2</sup>	26 Fe iron 55.84 3d <sup>6</sup> 4s <sup>2</sup>	27 Co cobalt 58.93 3d <sup>7</sup> 4s <sup>2</sup>	28 Ni nickel 58.69 3d <sup>8</sup> 4s <sup>2</sup>	29 Cu copper 63.55 3d <sup>10</sup> 4s <sup>1</sup>	30 Zn zinc 65.41 3d <sup>10</sup> 4s <sup>2</sup>	31 Ga gallium 69.72 4s <sup>2</sup> 4p <sup>1</sup>	32 Ge germanium 72.64 4s <sup>2</sup> 4p <sup>2</sup>	33 As arsenic 74.92 4s <sup>2</sup> 4p <sup>3</sup>	34 Se selenium 78.96 4s <sup>2</sup> 4p <sup>4</sup>	35 Br bromine 79.90 4s <sup>2</sup> 4p <sup>5</sup>	36 Kr krypton 83.80 4s <sup>2</sup> 4p <sup>6</sup>				
5	37 Rb rubidium 85.47 5s <sup>1</sup>	38 Sr strontium 87.62 5s <sup>2</sup>	39 Y yttrium 88.91 4d <sup>1</sup> 5s <sup>2</sup>	40 Zr zirconium 91.22 4d <sup>2</sup> 5s <sup>2</sup>	41 Nb niobium 92.91 4d <sup>4</sup> 5s <sup>1</sup>	42 Mo molybdenum 95.94 4d <sup>5</sup> 5s <sup>1</sup>	43 Tc technetium (98) 4d <sup>5</sup> 5s <sup>2</sup>	44 Ru ruthenium 101.07 4d <sup>7</sup> 5s <sup>1</sup>	45 Rh rhodium 102.90 4d <sup>8</sup> 5s <sup>1</sup>	46 Pd palladium 106.42 4d <sup>10</sup>	47 Ag silver 107.87 4d <sup>10</sup> 5s <sup>1</sup>	48 Cd cadmium 112.41 4d <sup>10</sup> 5s <sup>2</sup>	49 In indium 114.82 5s <sup>2</sup> 5p <sup>1</sup>	50 Sn tin 118.71 5s <sup>2</sup> 5p <sup>2</sup>	51 Sb antimony 121.76 5s <sup>2</sup> 5p <sup>3</sup>	52 Te tellurium 127.60 5s <sup>2</sup> 5p <sup>4</sup>	53 I iodine 126.90 5s <sup>2</sup> 5p <sup>5</sup>	54 Xe xenon 131.29 5s <sup>2</sup> 5p <sup>6</sup>				
6	55 Cs cesium 132.91 6s <sup>1</sup>	56 Ba barium 137.33 6s <sup>2</sup>	57 La lanthanum 138.91 5d <sup>1</sup> 6s <sup>2</sup>	72 Hf hafnium 178.49 5d <sup>2</sup> 6s <sup>2</sup>	73 Ta tantalum 180.95 5d <sup>4</sup> 6s <sup>2</sup>	74 W tungsten 183.84 5d <sup>4</sup> 6s <sup>2</sup>	75 Re rhenium 186.21 5d <sup>5</sup> 6s <sup>2</sup>	76 Os osmium 190.23 5d <sup>6</sup> 6s <sup>2</sup>	77 Ir iridium 192.22 5d <sup>7</sup> 6s <sup>2</sup>	78 Pt platinum 195.08 5d <sup>9</sup> 6s <sup>1</sup>	79 Au gold 196.97 5d <sup>10</sup> 6s <sup>1</sup>	80 Hg mercury 200.59 5d <sup>10</sup> 6s <sup>2</sup>	81 Tl thallium 204.38 6s <sup>2</sup> 6p <sup>1</sup>	82 Pb lead 207.2 6s <sup>2</sup> 6p <sup>2</sup>	83 Bi bismuth 208.98 6s <sup>2</sup> 6p <sup>3</sup>	84 Po polonium (209) 6s <sup>2</sup> 6p <sup>4</sup>	85 At astatine (210) 6s <sup>2</sup> 6p <sup>5</sup>	86 Rn radon (222) 6s <sup>2</sup> 6p <sup>6</sup>				
7	87 Fr francium (223) 7s <sup>1</sup>	88 Ra radium (226) 7s <sup>2</sup>	89 Ac actinium (227) 6d <sup>1</sup> 7s <sup>2</sup>	104 Rf rutherfordium (261) 6d <sup>4</sup> 7s <sup>2</sup>	105 Db dubnium (262) 6d <sup>5</sup> 7s <sup>2</sup>	106 Sg seaborgium (266) 6d <sup>6</sup> 7s <sup>2</sup>	107 Bh bohrium (264) 6d <sup>7</sup> 7s <sup>2</sup>	108 Hs hassium (277) 6d <sup>8</sup> 7s <sup>2</sup>	109 Mt meitnerium (268) 6d <sup>9</sup> 7s <sup>2</sup>	110 Ds darmstadtium (271) 6d <sup>10</sup> 7s <sup>2</sup>	111 Rg roentgenium (272) 6d <sup>10</sup> 7s <sup>2</sup>	112 Cp copernicium (277) 6d <sup>10</sup> 7s <sup>2</sup>	113	114 Fl flerovium (289) 7s <sup>2</sup> 7p <sup>2</sup>	115	116 Lv livermorium (293) 7s <sup>2</sup> 7p <sup>4</sup>	117	118				
6	58 Ce cerium 140.12 4f <sup>1</sup> 5d <sup>1</sup> 6s <sup>2</sup>	59 Pr praseodymium 140.91 4f <sup>3</sup> 6s <sup>2</sup>	60 Nd neodymium 144.24 4f <sup>4</sup> 6s <sup>2</sup>	61 Pm promethium (145) 4f <sup>5</sup> 6s <sup>2</sup>	62 Sm samarium 150.36 4f <sup>6</sup> 6s <sup>2</sup>	63 Eu europium 151.96 4f <sup>7</sup> 6s <sup>2</sup>	64 Gd gadolinium 157.25 4f <sup>7</sup> 5d <sup>1</sup> 6s <sup>2</sup>	65 Tb terbium 158.93 4f <sup>9</sup> 6s <sup>2</sup>	66 Dy dysprosium 162.50 4f <sup>10</sup> 6s <sup>2</sup>	67 Ho holmium 164.93 4f <sup>11</sup> 6s <sup>2</sup>	68 Er erbium 167.26 4f <sup>12</sup> 6s <sup>2</sup>	69 Tm thulium 168.93 4f <sup>13</sup> 6s <sup>2</sup>	70 Yb ytterbium 173.04 4f <sup>14</sup> 6s <sup>2</sup>	71 Lu lutetium 174.97 5d <sup>1</sup> 6s <sup>2</sup>	Lanthanoids (lanthanides)							
7	90 Th thorium 232.04 6d <sup>2</sup> 7s <sup>2</sup>	91 Pa protactinium 231.04 5f <sup>2</sup> 6d <sup>1</sup> 7s <sup>2</sup>	92 U uranium 238.03 5f <sup>3</sup> 6d <sup>1</sup> 7s <sup>2</sup>	93 Np neptunium (237) 5f <sup>4</sup> 6d <sup>1</sup> 7s <sup>2</sup>	94 Pu plutonium (244) 5f <sup>6</sup> 7s <sup>2</sup>	95 Am americium (243) 5f <sup>7</sup> 7s <sup>2</sup>	96 Cm curium (247) 5f <sup>8</sup> 6d <sup>1</sup> 7s <sup>2</sup>	97 Bk berkelium (247) 5f <sup>9</sup> 7s <sup>2</sup>	98 Cf californium (251) 5f <sup>10</sup> 7s <sup>2</sup>	99 Es einsteinium (252) 5f <sup>11</sup> 7s <sup>2</sup>	100 Fm fermium (257) 5f <sup>12</sup> 7s <sup>2</sup>	101 Md mendelevium (258) 5f <sup>13</sup> 7s <sup>2</sup>	102 No nobelium (259) 5f <sup>14</sup> 7s <sup>2</sup>	103 Lr lawrencium (262) 6d <sup>1</sup> 7s <sup>2</sup>	Actinoids (actinides)							

Molar masses (atomic weights) quoted to the number of significant figures given here can be regarded as typical of most naturally occurring samples.

## 8-10 guruh elementlarining elektron tuzilishi

1-jadval

<b>Fe</b> <b>3d<sup>6</sup>4s<sup>2</sup></b>	<b>Co</b> <b>3d<sup>7</sup>4s<sup>2</sup></b>	<b>Ni</b> <b>3d<sup>8</sup>4s<sup>2</sup></b>
<b>Re</b> <b>4d<sup>7</sup>5s<sup>1</sup></b>	<b>Rh</b> <b>4d<sup>8</sup>5s<sup>1</sup></b>	<b>Pd</b> <b>4d<sup>10</sup>5s<sup>0</sup></b>
<b>Os</b> <b>5d<sup>6</sup>6s<sup>2</sup></b>	<b>Ir</b> <b>5d<sup>7</sup>6s<sup>2</sup></b>	<b>Pt</b> <b>5d<sup>9</sup>6s<sup>1</sup></b>
<b>Hs</b> <b>5f<sup>14</sup>6d<sup>6</sup>7s<sup>2</sup></b>	<b>Mt</b> <b>5f<sup>14</sup>6d<sup>7</sup>7s<sup>2</sup></b>	<b>Ds</b> <b>5f<sup>14</sup>6d<sup>9</sup>7s<sup>1</sup></b>

Oksidlari **MeO**, **Me<sub>2</sub>O<sub>3</sub>**, gidroksidlari **Me(OH)<sub>2</sub>** va **Me(OH)<sub>3</sub>**.

**Fe<sup>+3</sup>**, **Co<sup>+2</sup>** va **Ni<sup>+2</sup>** birikmalari barqaror.

# Temir oilasi elementlarining asosiy kattaliklari

2-jadval

Asosiy kattaliklar	Fe	Co	Ni
Atom massa	55,847	58,933	58,71
El.formulasi	$3d^64s^2$	$3d^74s^2$	$3d^84s^2$
Atom radiusi, nm	0,126	0,125	0,124
$E^{2+}$ , ion. rad., nm	0,084	0,078	0,074
$E^{3+}$ , ion. rad., nm	0,067	0,064	0,062
Suyuq.har, °C	1539	1492	1455
Zichlik, g/sm <sup>3</sup>	7,87	8,84	8,91
Ionl. energ. $M \rightarrow Me^{2+}$	7,89	7,87	7,63
Yer po'stlog'ida tarqalishi, %	5,1	$3 \cdot 10^{-3}$	$8 \cdot 10^{-3}$



# Temirning tabiatda tarqalgan birikmlari



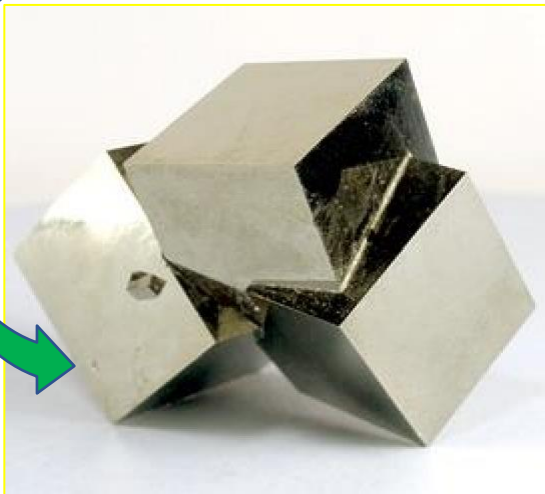
**Pirit- $\text{FeS}_2$**



**Gematit- $\text{Fe}_2\text{O}_3$  (60%)**



**Magnetit- $\text{Fe}_3\text{O}_4$  (73%)**



**Siderit- $\text{FeCO}_3$**



**Limonit- $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$  (60%)**



# Fe olinishi va fizik xossalari

- Toza temir kumushrang-oq metall, Al dan qattiqroq, Au va Ag dan yumshoq.
- Toza Fe suyuql. h/  $1539^{\circ}\text{C}$ ,  $600^{\circ}\text{C}$  da yumshaydi.  $1000^{\circ}\text{C}$  da bir-biri bilan oson ulanib, sim shakliga keltirish mumkin.
- Temir 4 ta allotropik modifikatsiyaga:  $\alpha$ ,  $\beta$ ,  $\gamma$  va  $\delta$  ega.
- $\alpha$  -  $769^{\circ}\text{C}$  da,  $\beta$  -  $910^{\circ}\text{C}$  da,  $\gamma$  -  $1400^{\circ}\text{C}$  da va  $\delta$  -  $1510^{\circ}\text{C}$  da barqaror.

## OLINISHI:

Laboratoriyada  $\text{FeCl}_2$  yoki  $\text{FeCl}_3$  eritmalari dastlab qizdiriladi, so'ngra elektroliz qilinadi.

Vodorod yordamida qaytarib:  $\text{Fe}_2\text{O}_3 + 3\text{H}_2 = 2\text{Fe} + 3\text{H}_2\text{O}$

Pentakarbonil Fe ni havosiz muhitda qizdirib:  $[\text{Fe}(\text{CO})_5] = \text{Fe} + 5\text{CO}$

Termit (alyuminotermiya):  $8\text{Al} + 3\text{Fe}_3\text{O}_4 = 9\text{Fe} + 4\text{Al}_2\text{O}_3$

Domna pechlarida:  $3\text{Fe}_2\text{O}_3 + \text{CO} = 2\text{Fe}_3\text{O}_4 + \text{CO}_2$

$\text{Fe}_3\text{O}_4 + \text{CO} = 3\text{FeO} + \text{CO}_2$        $\text{FeO} + \text{CO} = \text{Fe} + \text{CO}_2$

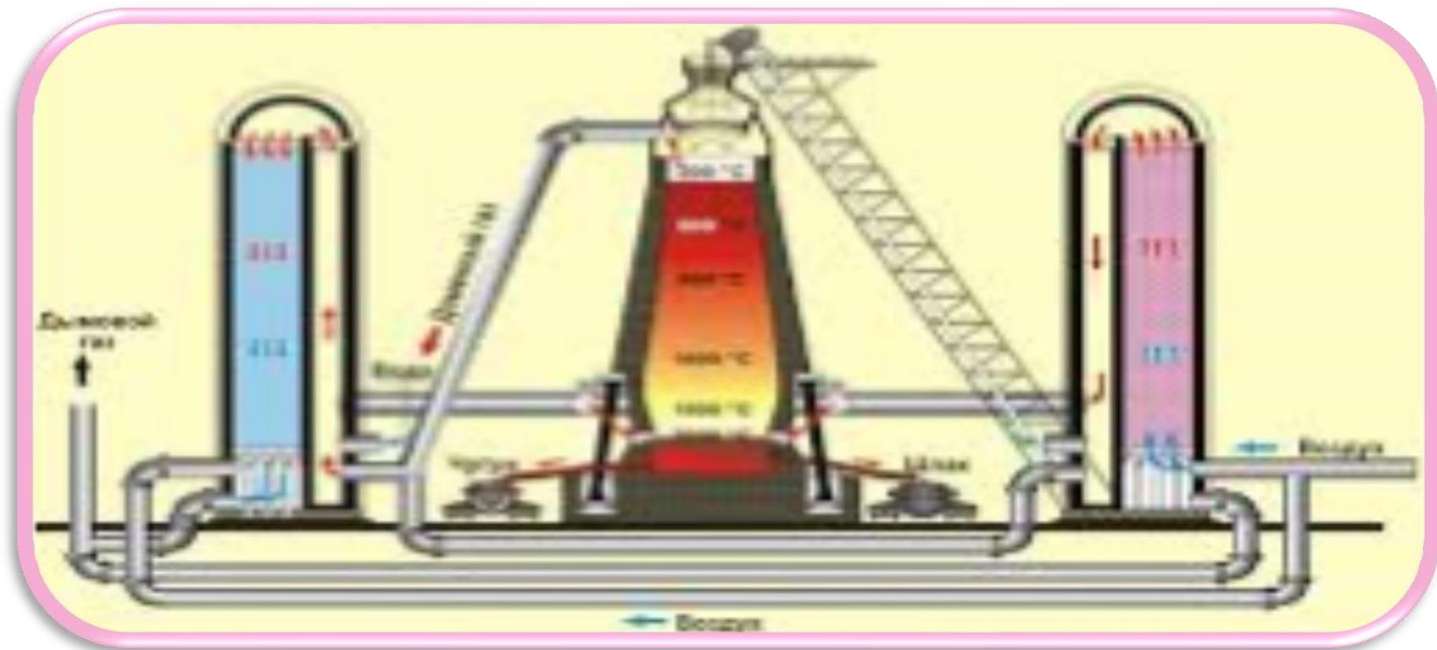
Texnikada cho'yan mineral birikmalardan olinadi.  $t_{\text{suyuql}} = 1100^{\circ}\text{C}$ .

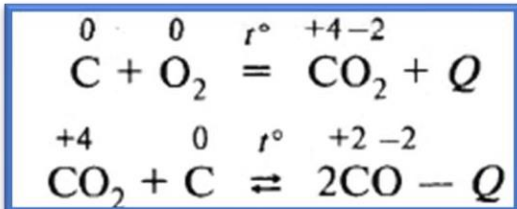
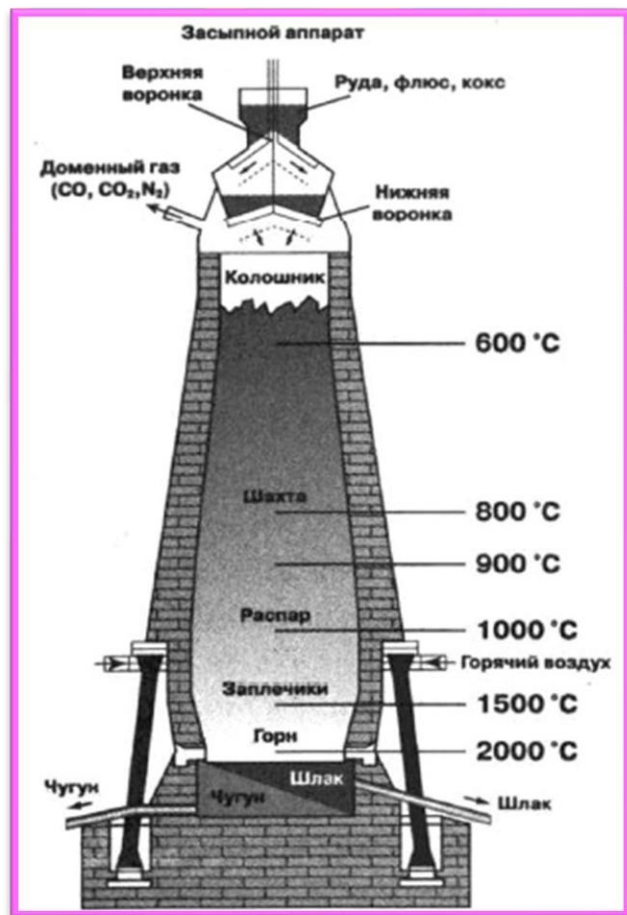
Cho'yan – tarkibida 95% Fe va 1,7% dan ko'p C, S, Si, Mn tutadi.

Po'lat – tarkibida taqriban 0,2% dan 1,7% gacha uglerod tutadi.

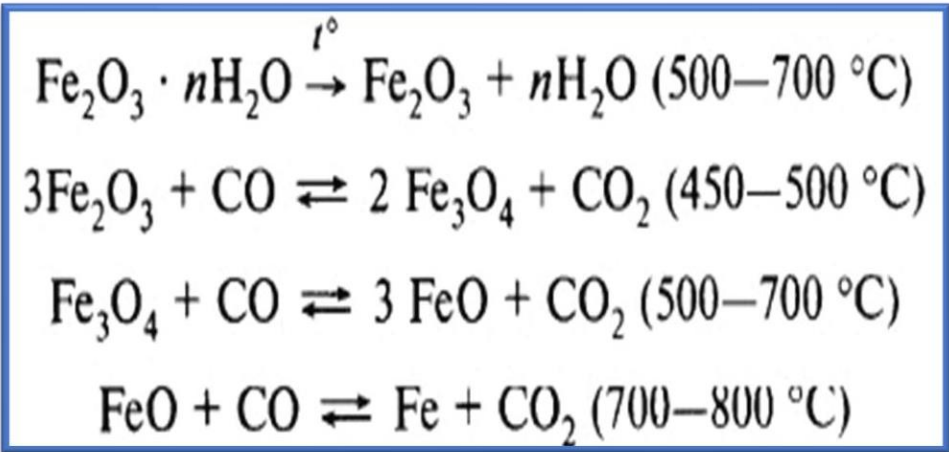
# Cho'yan va po'lat ishlab chiqarish

Domna pechlarida uglerod miqdori 0,3 dan 2% gacha bo'lgan cho'yan qattiq po'lat deb ataladi. Agar qotishma tarkibi 0,3% dan kam uglerod bo'lsa, u yumshoq po'lat yoki temir deb ataladi. Temirning cho'yandan olinishi uning aralashmalarining oksidlanishiga asoslanadi.





**Asta-sekin ruda quyidagi o'zgarishlarga uchraydi:**



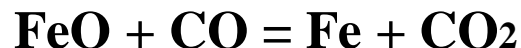
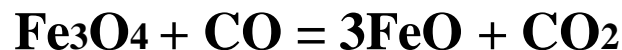
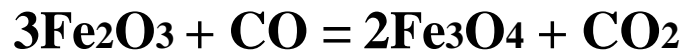
**Cho'yan po'latdan qattiqroq va ishlov berish juda qiyin bo'lgani uchun u faqat qoliplarda qo'llaniladi. Po'lat yumshoq va moslashuvchan.**



## Fe ning kimyoviy xossalari

Temir quymalaridan **cho'yan**, po'lat. Cho'yan suyuql.h. 1100°C. Tarkibi 95% Fe, 1,7% dan ko'proq C, S, Si, Mn.

Domna pechidagi temirning qaytarilishi:



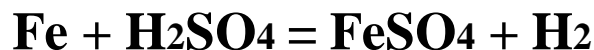
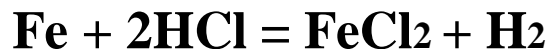
Nam sharoitda Fe:



Fe uzoq vaqt havoda qizdirilganda:



## Temir kislotalar ishtirokida:



Kons.  $\text{H}_2\text{SO}_4$  (300°C):



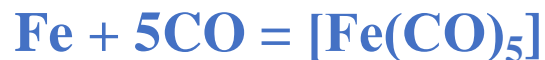
100 % li  $\text{H}_2\text{SO}_4$  va kons.  $\text{HNO}_3$  – Fe ni passivlaydi:

Fe suyultirilgan  $\text{HNO}_3$  ishtirokida NO,  $\text{N}_2$ ,  $\text{N}_2\text{O}$ ,  $\text{NH}_4\text{NO}_3$ :



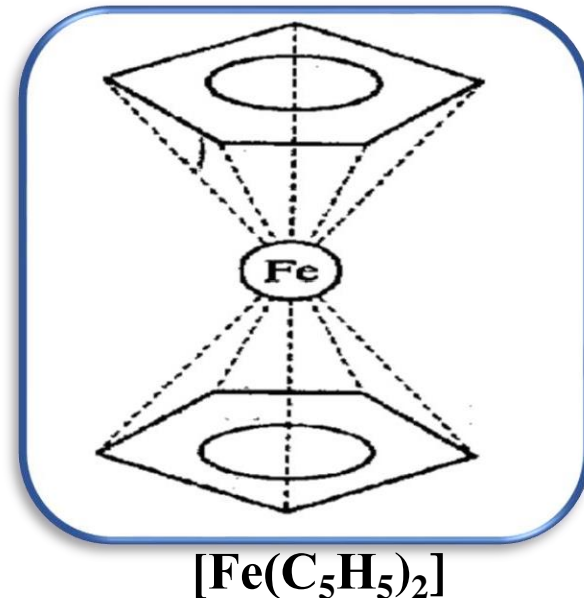
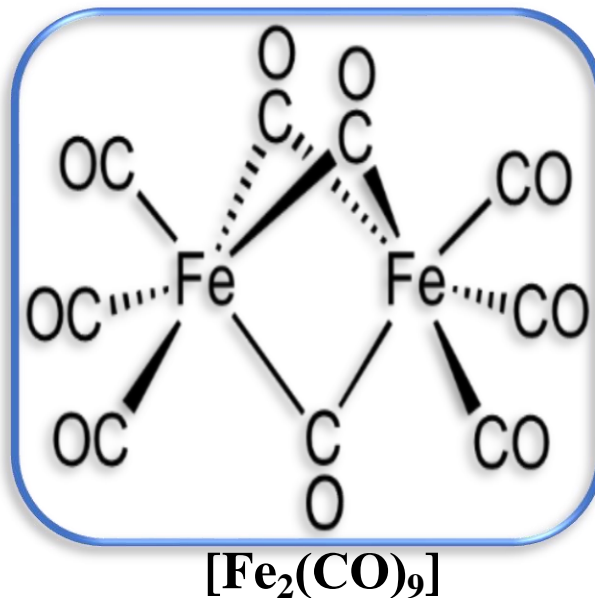
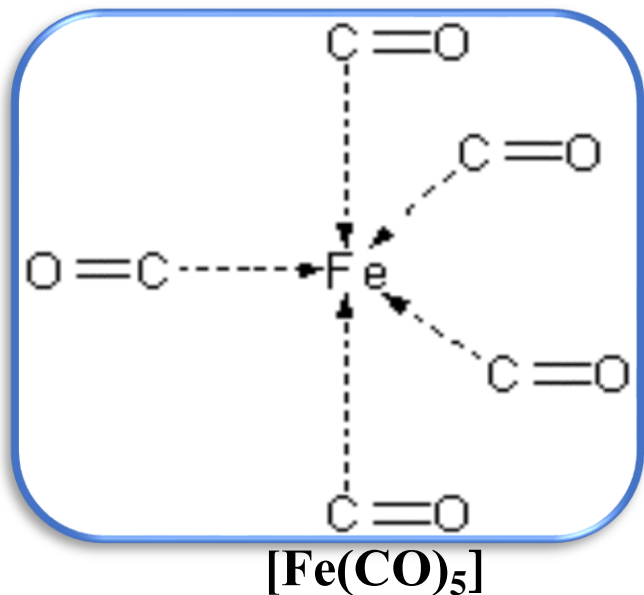
# Temir (0) birikmalari

❖ Temir kukuni ustidan 150-200°C qizdirish va CO gazini 1•10<sup>4</sup>-2•10<sup>4</sup> kPa bosimda o'tkazish:



Temir pentakarbonil, sariq eritma. ( $T_{\text{suyuq}} = -20^\circ\text{C}$ ,  $T_{\text{qay}} = 103^\circ\text{C}$ ).  
Suvda erimaydi.

❖ Yana –  $[\text{Fe}_2(\text{CO})_9]$ ,  $[\text{Fe}(\text{NO})_5]$  va ferrosen  $[\text{Fe}(\text{C}_5\text{H}_5)_2]$  ham olingan.  
Ferrosen  $[\text{Fe}(\text{C}_5\text{H}_5)_2]$  – suyuql.h. 171°C, qaynash harorati 249°C ga teng bo'lgan sariq kristall modda. Organizm CO b/n zaharlanganda foydalaniladi.

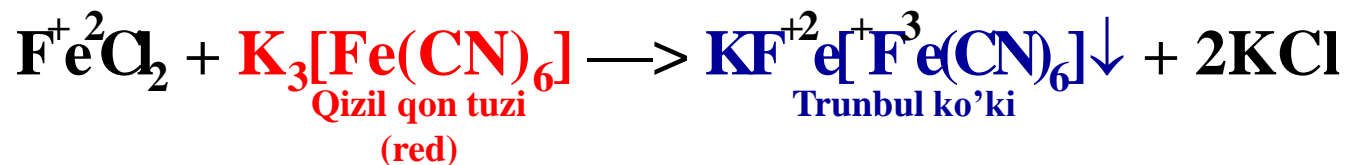


# Fe (II) birikmalari

FeO – qora kukun:



Fe<sup>2+</sup> ionini aniqlash u-n qizil qon tuzi yoki NaOH dan foydalaniladi:



Fe(OH)<sub>2</sub> – qora-yashil rangli kukun

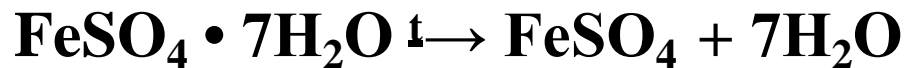


Havoda tez qorayib, gidrolizlanadi:



FeSO<sub>4</sub>•7H<sub>2</sub>O qizdirilganda suv ajralib chiqib ketib, quruq tuz qoladi.

Davomiy qizdirilganda:



FeSO<sub>4</sub> qaytaruvchi:





## Fe (II) birikmalari



FeS<sub>2</sub>

**Oltinugurt b/n:**  $\text{Fe} + \text{S} = \text{FeS}$ ,  $\text{Fe} + 2\text{S} = \text{FeS}_2$

**Temir N<sub>2</sub> va P lar bilan:**  $\text{Fe}_2\text{N}$ ,  $\text{Fe}_4\text{N}$ ,  $\text{Fe}_3\text{Si}$ ,  $\text{Fe}_3\text{P}$ ,  $\text{Fe}_2\text{P}$ .

**Gidridlar:** **FeH**, **FeH<sub>2</sub>**, **FeH<sub>3</sub>** va **FeH<sub>6</sub>**.

**Mor tuzi:**  $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4$ .

**Eritmada barqaror**  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ .

**FeS-qora, FeCO<sub>3</sub>-oq rangda.**

**Fe<sup>2+</sup> koor.son. 6 ga teng.**  $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ ;  $[\text{FeF}_6]^{4-}$

**Piritning OQ xossalari:**  $\text{FeS}_2 + \text{FeS}_2 = 2\text{FeS} + 2\text{S}$

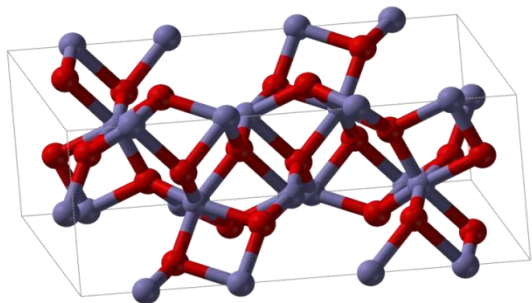
**Temir (II) tuzlari oson gidrolizga uchraydi:**

**1-bosqich:**  $2\text{FeSO}_4 + 2\text{H}_2\text{O} \leftrightarrow [\text{Fe}(\text{OH})_2]\text{SO}_4 + \text{H}_2\text{SO}_4$

$2\text{Fe}^{2+} + 2\text{SO}_4^{2-} + 2\text{HOH} \leftrightarrow 2\text{FeOH}^+ + 2\text{SO}_4^{2-} + 2\text{H}^+$

**2-bosqich:**  $[\text{Fe}(\text{OH})_2]\text{SO}_4 + 2\text{H}_2\text{O} \leftrightarrow 2\text{Fe}(\text{OH})_2\downarrow + \text{H}_2\text{SO}_4$

$2\text{FeOH}^+ + \text{SO}_4^{2-} + 2\text{HOH} \leftrightarrow 2\text{Fe}(\text{OH})_2\downarrow + \text{SO}_4^{2-} + \text{H}^+(\text{kation bo'yicha})$



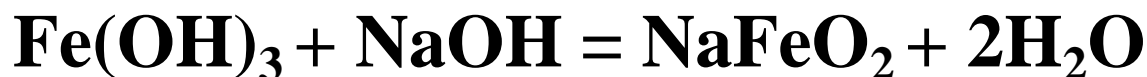
## Fe (III) birikmalari



$\text{Fe}^{3+}$  -  $\text{Fe}_2\text{O}_3$  (qoramtir qizil rangdan **qizilgacha**).

Temirli surik, mumiyo, oxra bo'yoq.

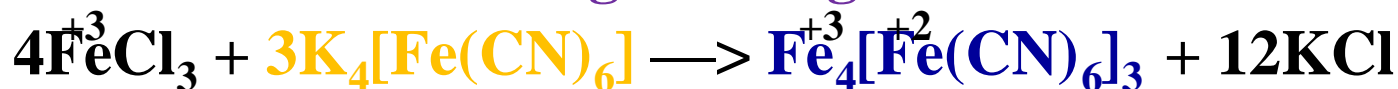
$\text{Fe}(\text{OH})_3$  – **qizil-jigarrang, amfoter:**



Yangi tayyorlangan  $\text{Fe}(\text{OH})_3$  -  $\text{KOH}$  eritmasi b/n (qizil):



**Berlin zangorisining olinishi:**



Sariq qon tuzi

Berlin zangorisi

$\text{K}_4[\text{Fe}(\text{CN})_6]$  - sariq qon tuzi.  
(gold)

**$\text{Fe}^{3+}$  ioni uchun sifat reaksiya:**



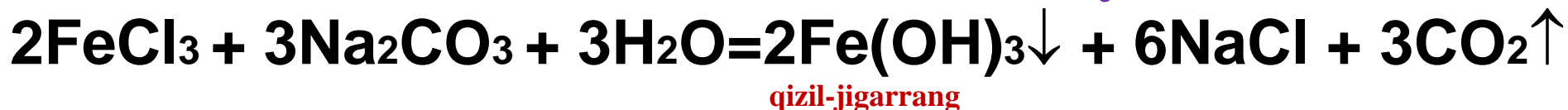
# Fe (III) birikmalari

$\text{H}_3\text{FeO}_3$  (ortoferrit) va  $\text{HFeO}_2$  (metaferrit) tuzlari  
( $\text{K}_3\text{FeO}_3$ ,  $\text{KFeO}_2$ ).

$\text{K}_2\text{SO}_4 \cdot \text{Fe}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$  achchiq tosh

Xlor va Fe:  $2\text{Fe} + 3\text{Cl}_2 = 2\text{FeCl}_3$

$\text{Fe}^{3+}$  ioni uchun sifat reaksiya:



$\text{FeCl}_3$  – qon to'xtatuvchi vosita.

Qo'sh tuzlari:  $\text{Na}[\text{FeCl}_4]$ ,  $\text{Na}_3[\text{FeCl}_6]$ .

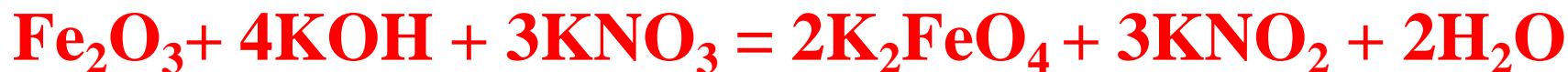
906°C da karbid ( $\text{Fe}_3\text{C}$ ).





# Fe (VI) va Fe (VIII) birikmalari

1) Ferrat k-ta ( $\text{H}_2\text{FeO}_4$ ) tuzlari – bariy ferrat ( $\text{BaFeO}_4$ ), kaliy ferrat ( $\text{K}_2\text{FeO}_4$ ).

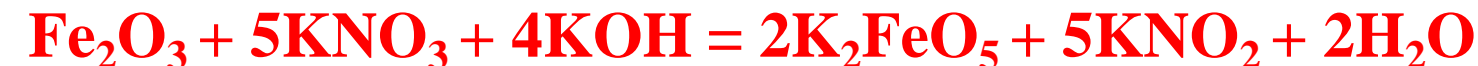


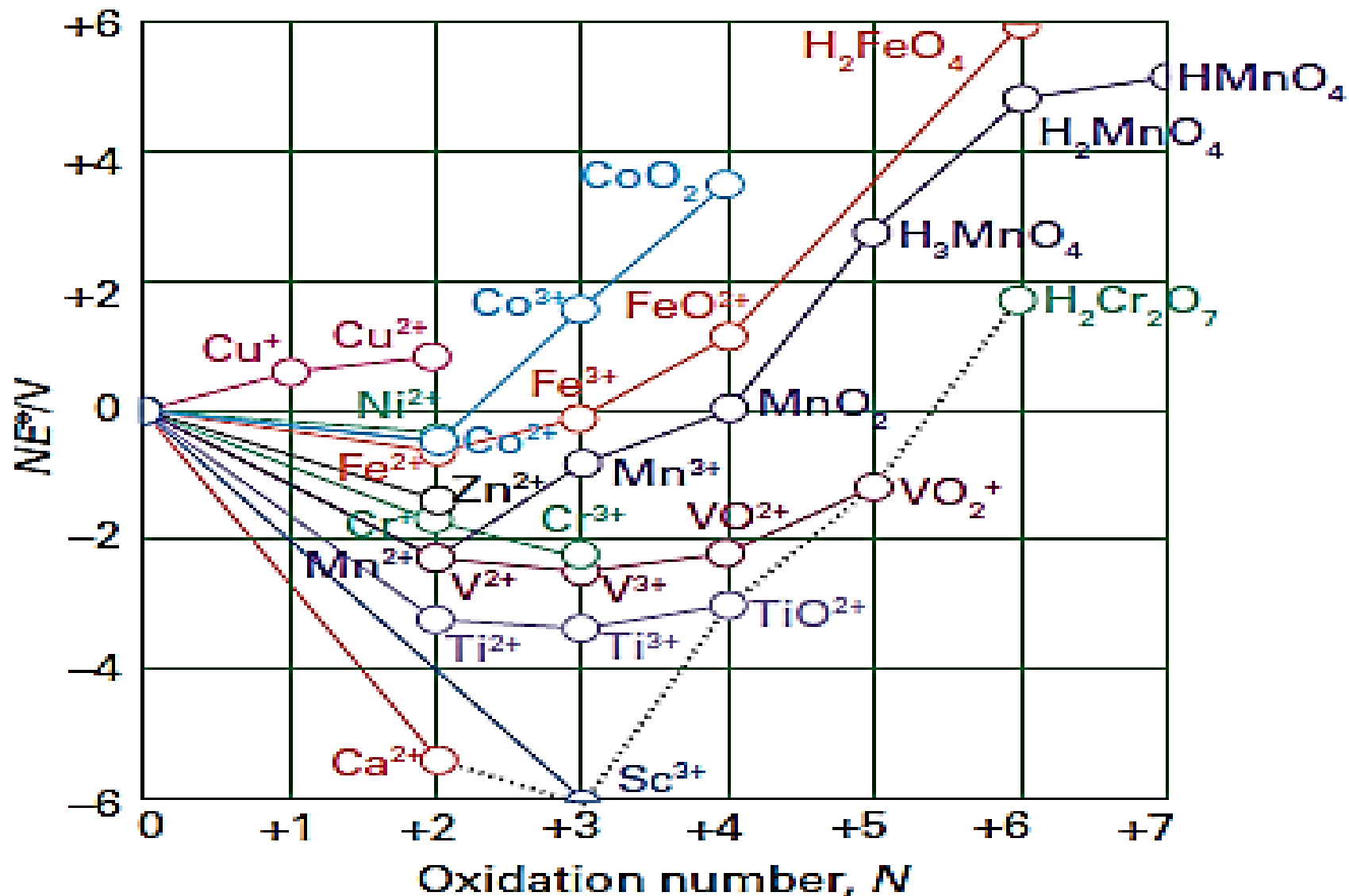
$\text{K}_2\text{FeO}_4$  – shuningdek, 30% li ishqor eritmasini temir elektrod bilan elektroliz qilish orqali ham olinadi. :



$\text{K}_2\text{FeO}_4$  – qizil kristall bo'lib, suvda qizil-pushti rangli eitma hosil qilib eriydi. Ba va Sr ishtirokida, eritmada erimaydigan  $\text{BaFeO}_4$  va  $\text{SrFeO}_4$  cho'kmalarni hosil qiladi.  $\text{FeO}_3$  birikmasi erkin holda olinmagan.

2) Peroksoferrat k-ta ( $\text{H}_2\text{FeO}_5$ ) tuzlari – ( $\text{K}_2\text{FeO}_5$ ):





**d-elementlar uchun Frost diagrammasi ko'rsatkichlari  
 pH=0  $\text{FeO}_4^{2-}$  juda kuchli oksidlovchi, uning oksidlovchilik  
 xossasi  $\text{MnO}_4^{2-}$  dan kuchli.**

# Kobalt va uning birikmalari



Kobaltit -  $\text{CoAsS}$



CoAs-milerit



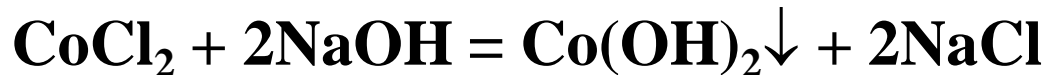
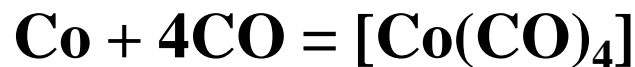
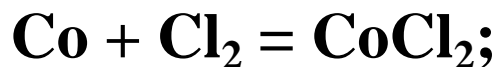
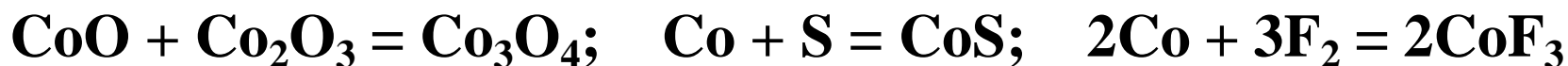
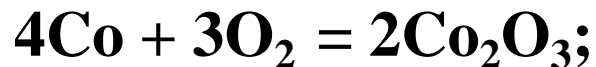
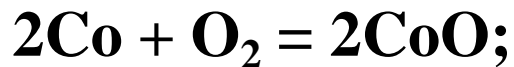
Skutterudit-(Co,Ni)  $\text{As}_3$

**NiAsS – nikel yaltirog'i.**

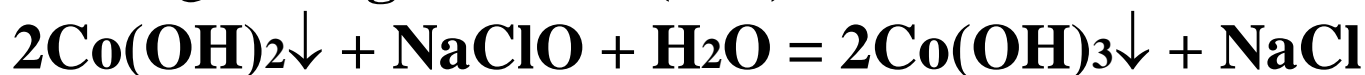
**Olinishi:** Kobalt  $\text{CoO}$ ,  $\text{Co}_2\text{O}_3$  yoki  $\text{Co}_3\text{O}_4$  ni  $\text{C}$ ,  $\text{CO}$ ,  $\text{Al}$ ,  $\text{H}_2$  bilan qaytariladi.



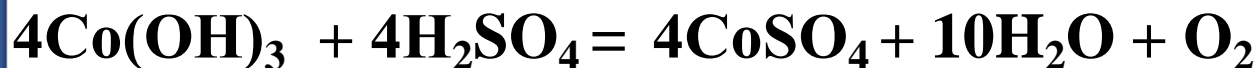
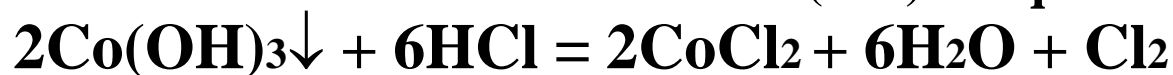
# Kobalt va nikelning kimyoviy xossalari



$\text{Co}(\text{OH})_2\downarrow$  - ko'k-pushti.

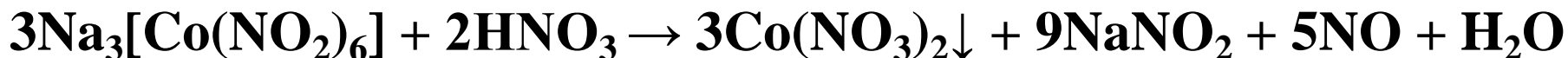


$\text{Co}(\text{OH})_3\downarrow$  - qoramtir-yashil.



Eritmada  $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$  pushti rangda.

Fisher reaktivi:



# Kobalt va nikelning kimyoviy xossalari

Kupfernikel – NiAs, NiAsS.

Ni kumushsimon-oq metall, juda mustahkam, magnitga tortiladi. Olinishi Co singari.

**NiO, Ni<sub>2</sub>O<sub>3</sub>, Ni(OH)<sub>2</sub> va Ni(OH)<sub>3</sub> - kabi birikmalari bor.**

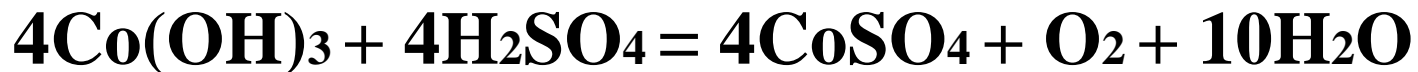


Ni(OH)<sub>2</sub> va Co(OH)<sub>2</sub> o'z-o'zidan oksidlanmaydi:



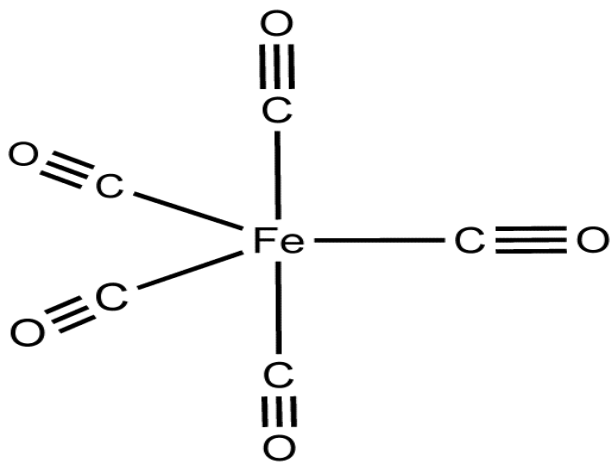
qora rangli

Eritmada **[Ni(H<sub>2</sub>O)<sub>6</sub>]<sup>2+</sup> - qoramtir-yashil rangda.**

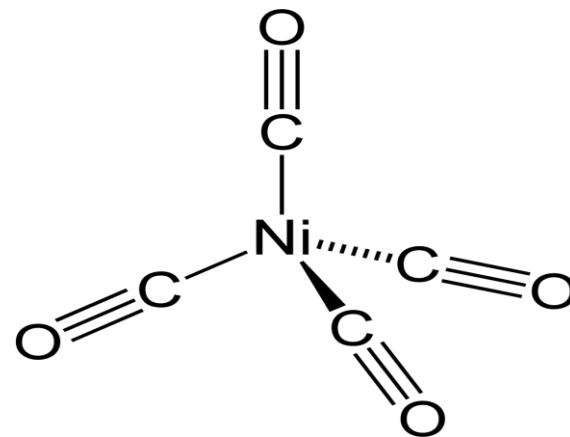


# SAMARALI ATOM RAQAMI SAM (SIJVIK QOIDASI)

- **Qoida:** Kompleks birikmalarda markaziy metall atomi o'zini shunday ligandlar bilan o'rab oladiki, metall atomidagi elektronlarning umumiy soni eng yaqin inert gaz atomidagi bilan bir xil bo'ladi. Kompleks hosil qiluvchi metall atomidagi elektronlar soni samarali atom raqami (SAR) deb ataladi.
- **Boshqa talqin:** Kompleks birikmalarda markaziy metall atomi o'zini shunday ligandlar bilan o'rab oladiki, bunda uning tashqi elektron qavatidagi elektronlarining umumiy soni 18 ga teng bo'ladi.



Fe  $3d^64s^2$



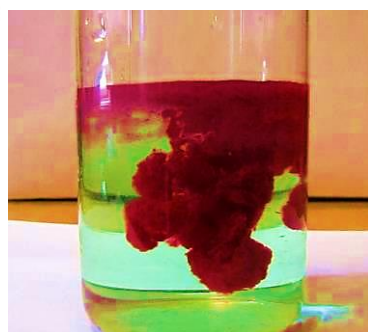
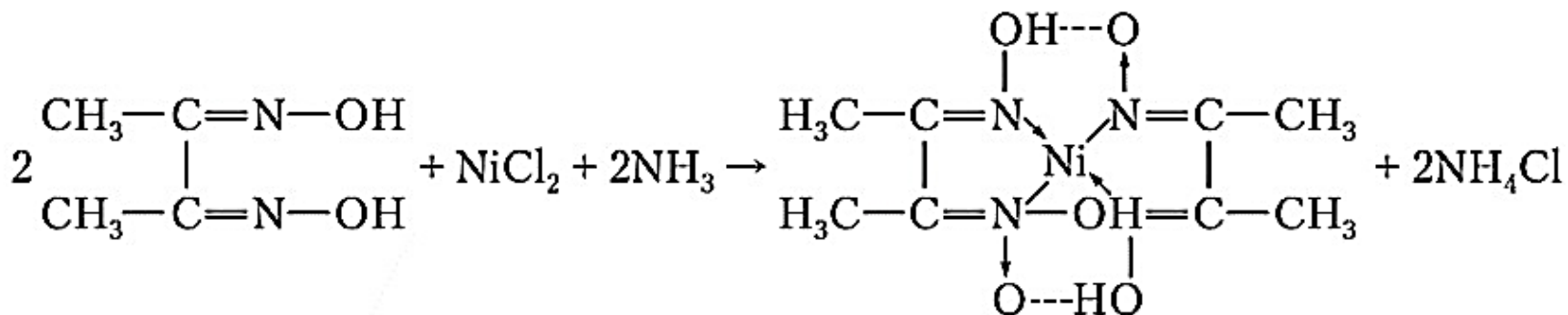
Ni  $3d^84s^2$

# Co (II) va Ni (II) uchun sifat reaksiyalar



yashil rang (Rinman yashili)

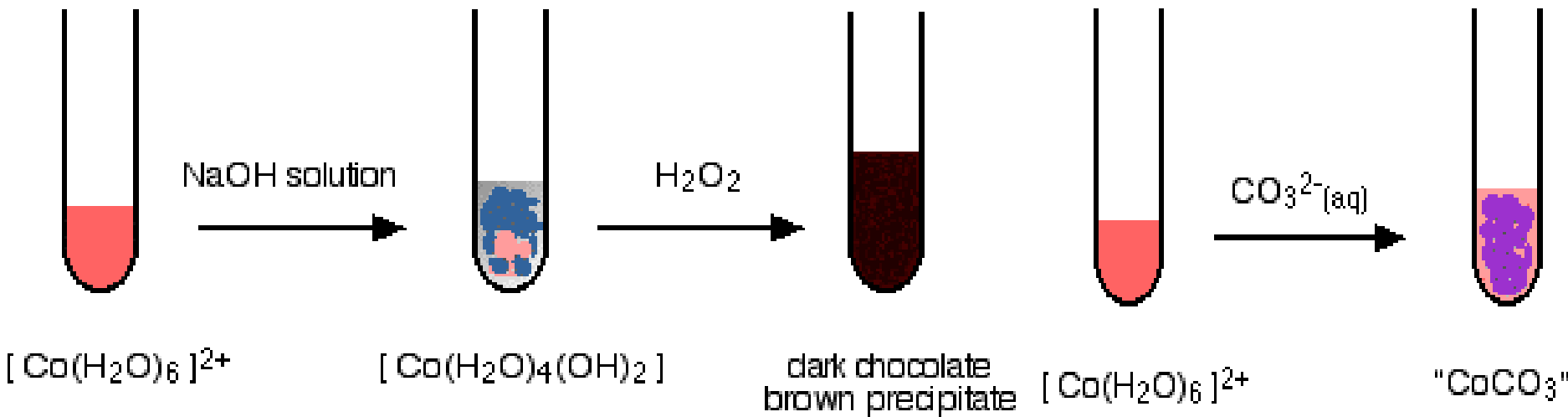
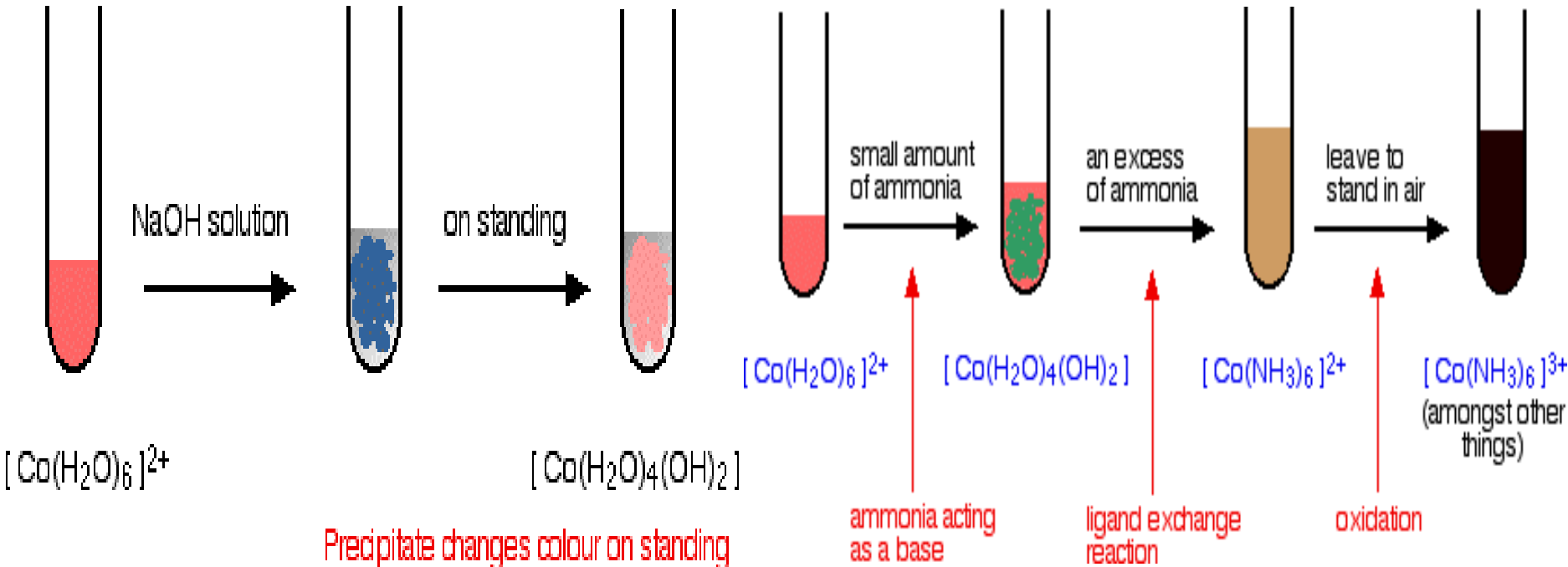
2.  $\text{Ni}^{2+}$  ioni Chugayev reaksiyasi orqali aniqlanadi.



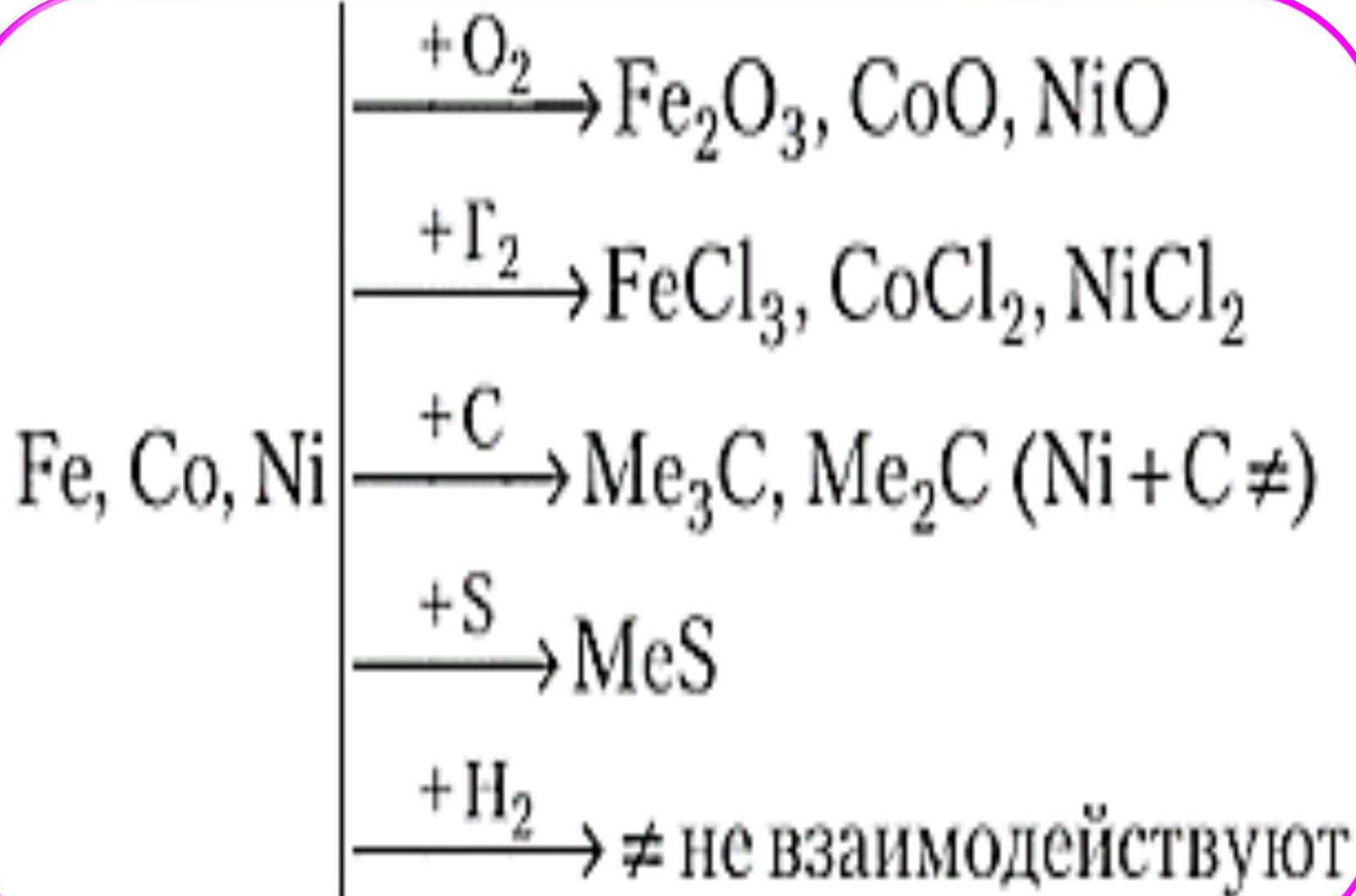
Dimetilglioksim  $\text{Ni}^{2+}$  ni analitik aniqlash uchun ishlatiladi.

**Pomadaga** – nikel (II) dimetilglioksim qo'shiladi.





# Temir, kobalt va nikelning kimyoviy xossalari



# Platina oilasi xossalari

Bu oilaga **Ru-Os, Rh-Ir, Pd-Pt** kiradi. Bu elementlar nodir metallar guruhiga kiradi. Ular kimyoviy jihatdan juda passiv, birikmalarda 0-8 oksidlanish darajasiga ega. Yer yuzida juda kam uchraydi.

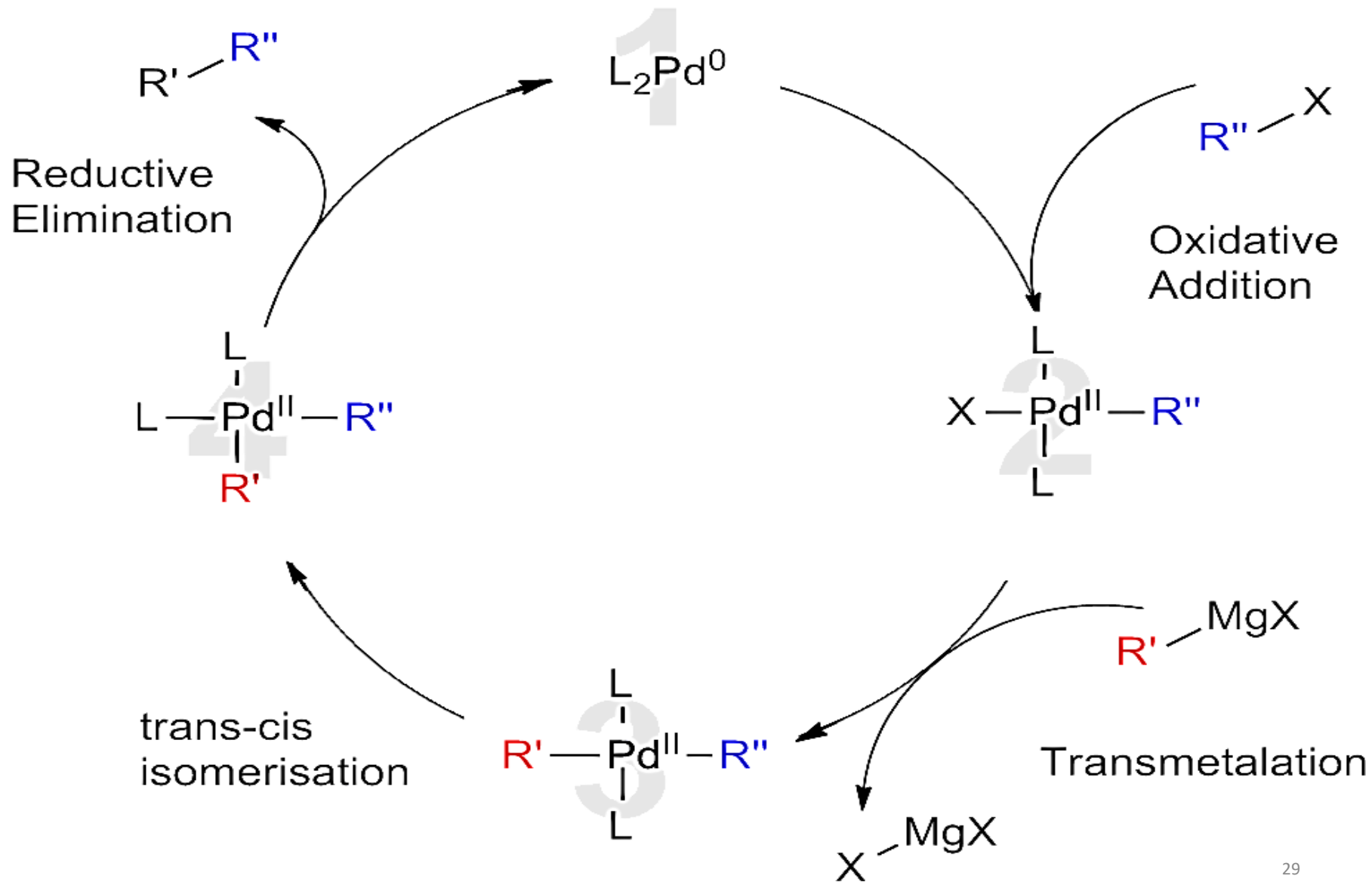
Ko'rsatkichlar	Ru	Rh	Pd	Os	Ir	Pt
$M^0$	$4d^75s^1$	$4d^85s^1$	$4d^{10}5s^0$	$5d^66s^2$	$5d^76s^2$	$5d^96s^1$
$M^0$	0,134	0,1342	0,137	0,135	0,135	0,138
$M^{4+}$	0,076	0,074	0,076	0,077	0,077	0,077
Suyuql. h., °C	2334	1963	1554	3027	2447	1769
Qay.h., °C	4077	3727	2937	5027	~4380	-3800
Zichlik.g/sm <sup>3</sup>	12,45	12,41	12,02	22,61	22,65	21,45

# Platina oilasi metallarini ayrim kimyoviy xossalari

- $3\text{Ru} + 18\text{HCl} + 4\text{HNO}_3 \rightarrow 3\text{H}_2[\text{RuCl}_6] + 4\text{NO} + 8\text{H}_2\text{O}$  (Rh, Ir)
- $3\text{Pd} + 18\text{HCl} + 4\text{HNO}_3 \rightarrow 3\text{H}_2[\text{PdCl}_6] + 4\text{NO} + 8\text{H}_2\text{O}$
- $3\text{Pt} + 18\text{HCl} + 4\text{HNO}_3 \rightarrow 3\text{H}_2[\text{PtCl}_6] + 4\text{NO} + 8\text{H}_2\text{O}$
  
- $\text{Pd} + 2\text{H}_2\text{SO}_4 \rightarrow \text{PdSO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$
- $\text{Os} + 8\text{HNO}_3 \rightarrow \text{OsO}_4 + 8\text{NO}_2 + 4\text{H}_2\text{O}$
- $\text{Ir (Rh)} + 2\text{Cl}_2 + 2\text{NaCl} \rightarrow \text{Na}_2[\text{IrCl}_6]$



# Pd ning katalitik xususiyati (Kumada o'zaro bog'lanish reaksiyasi uchun katalitik sikl)



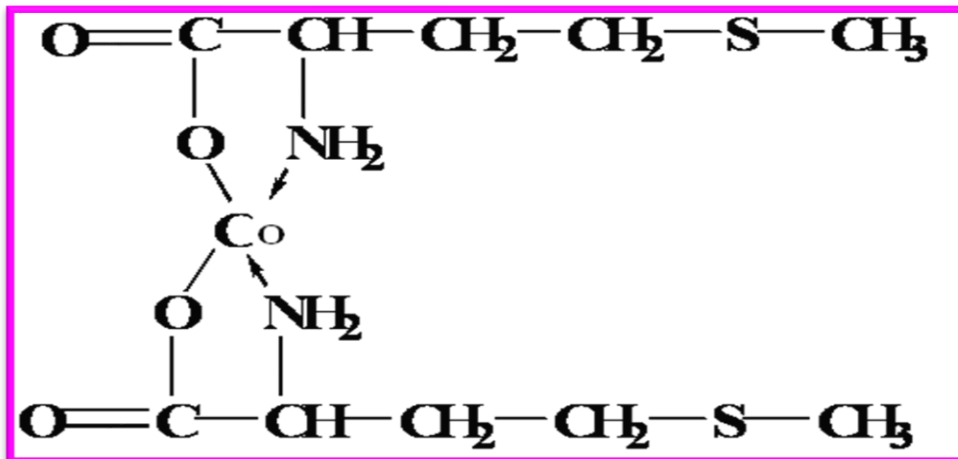
# Co ning farmatsiyadagi ahamiyati

## Vitamin B<sub>12</sub> (C<sub>63</sub>H<sub>88</sub>CoN<sub>14</sub>O<sub>14</sub>P).

Kobalt (III) ning B<sub>12</sub> kompleksi. B<sub>12</sub> tananing o'sishi, qon aylanishi, qizil qon hujayralari rivojlanishi, lipidlar va uglevodlar almashinuvi va qon ivishi uchun zarurdir.

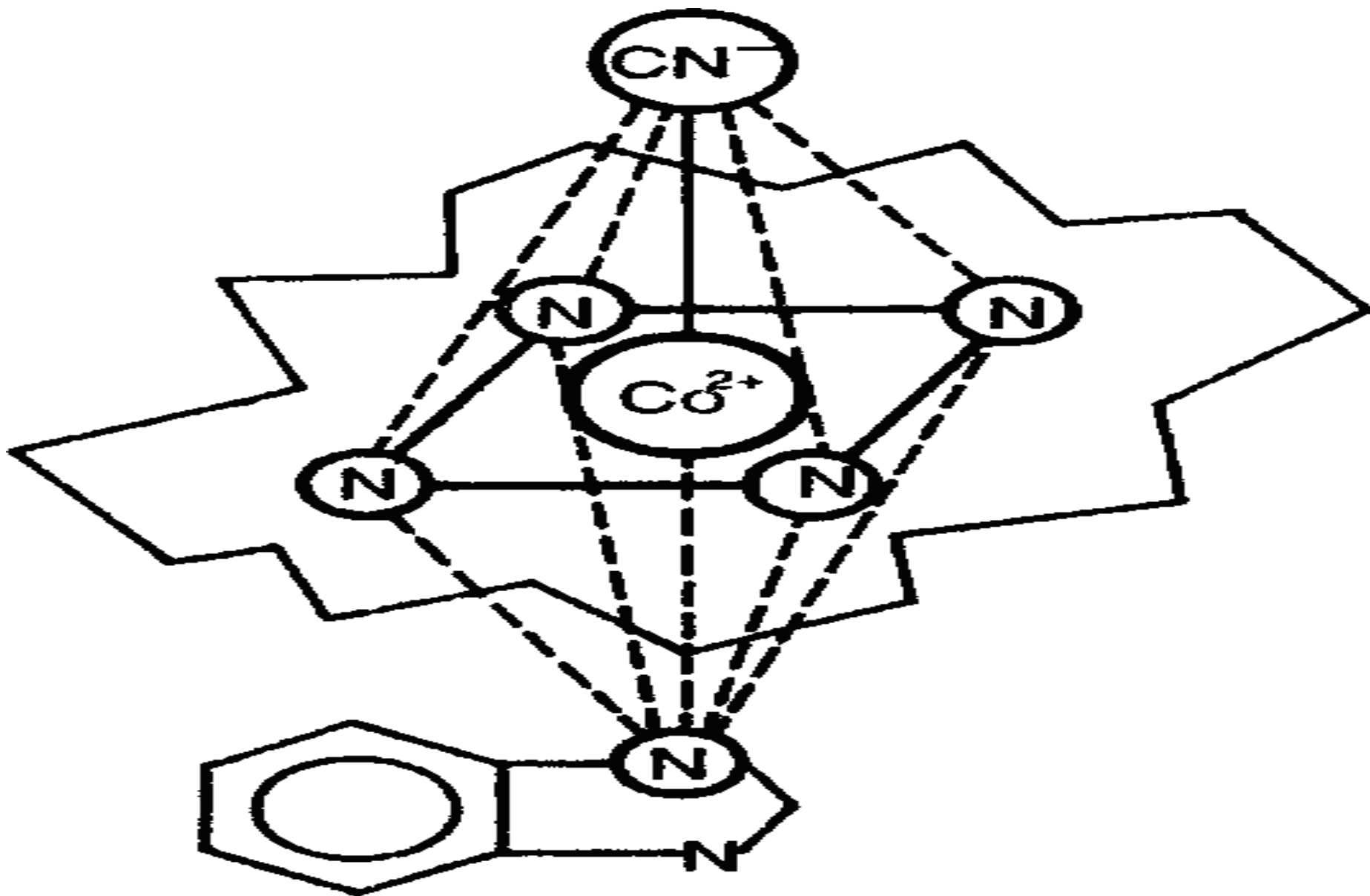
Vitamin etishmasligi anemiyaga olib keladi va organizmning yuqumli kasalliklarga chidamliligini pasaytiradi. Hayvonlar va odamlarning ichak devori B<sub>12</sub> vitamini ishlab chiqarishga qodir.

**Kobalt-30** – M.A.Azizov tomonidan Co hamda metionin asosida yaratilgan KB.



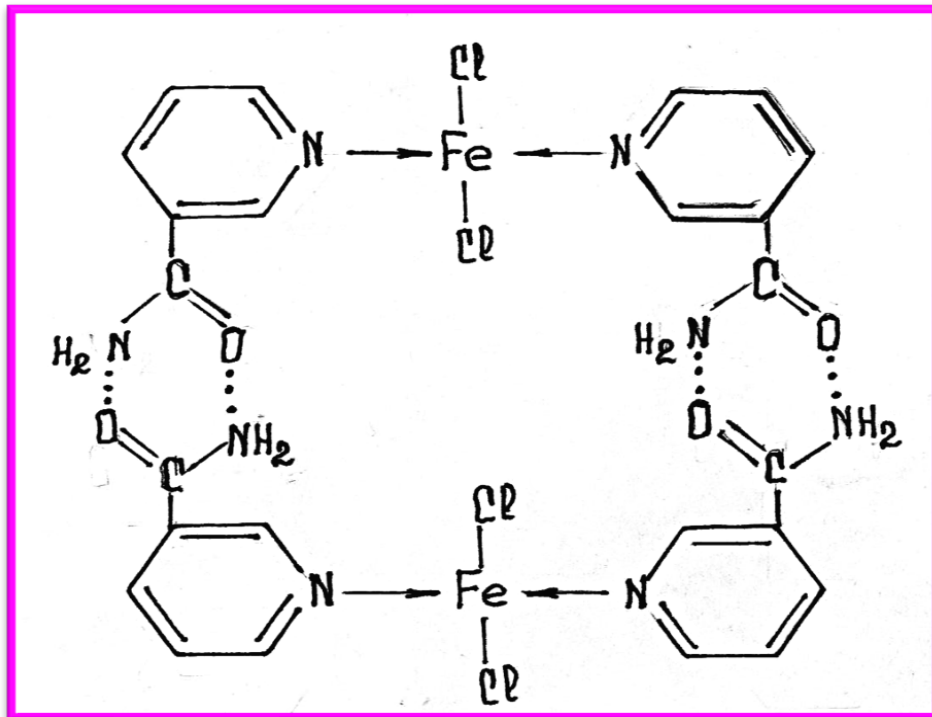
M<sub>M</sub>=355,34

# Vitamin B<sub>12</sub> (C<sub>63</sub>H<sub>88</sub>CoN<sub>14</sub>O<sub>14</sub>P).



# Fe ning farmatsiyadagi ahamiyati

- Fe kamqonlikda qo'llaniladi.
- **Feramid** – M.A.Azizov (Toshfarmi) Fe va nikotin kislotasi ishtirokida kompleks birikma sintez qilgan.
- **FERASK** nomli birikma Toshkimyofarm zavodida ishlab chiqilmoqda.
- Temir - temir laktat va temir gliserati sifatida ham mavjud.



## Feramid



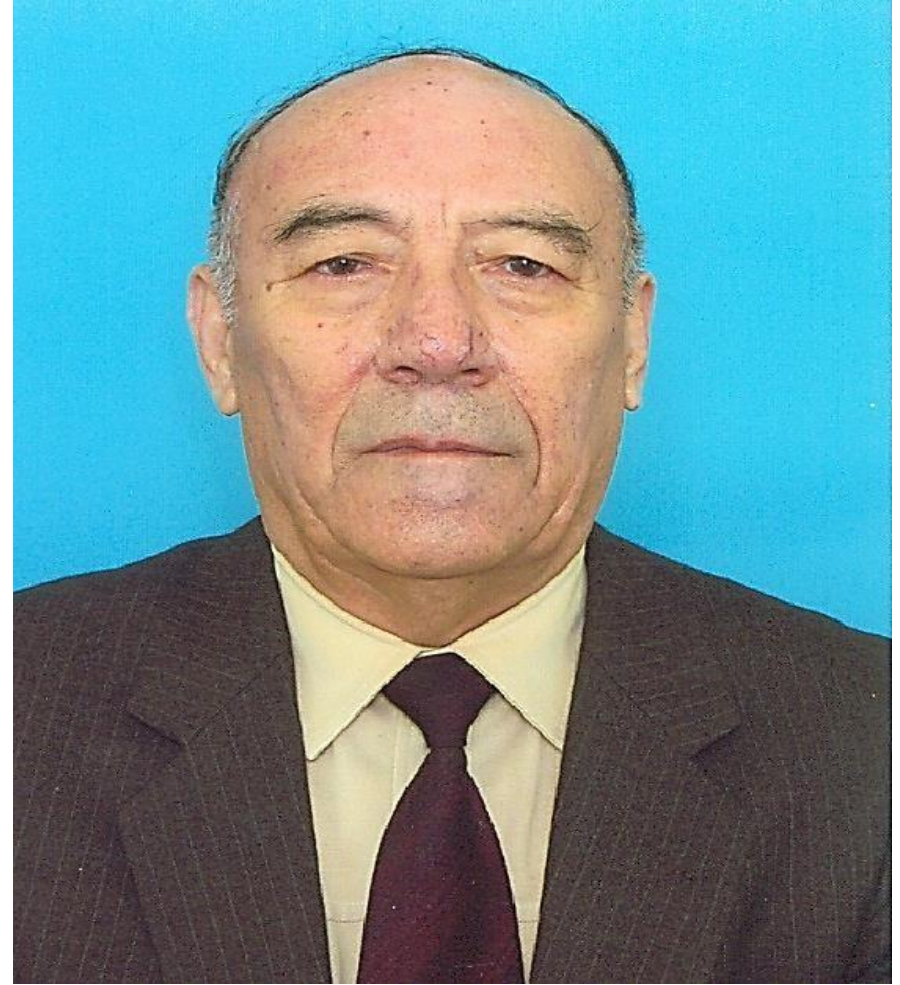
MM 371,01



# O'zbekistonda koordinatsion birikmalari kimyosi yo'nalishiga katta hissa qo'shgan olimlar



- M.A. Azizov - k.f.d, professor
- O'z.Res. xizmat ko'rsatgan xodim



- N.A. Parpiyev - k.f.d., professor
- O'zRes. akademigi

# Fe ning farmatsiyadagi ahamiyati

$\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  - tuzning og'irligi bo'yicha 20% temir.

$\text{FeCl}_2 \cdot 4\text{H}_2\text{O}$  - tuzning og'irligi bo'yicha 28% temir.

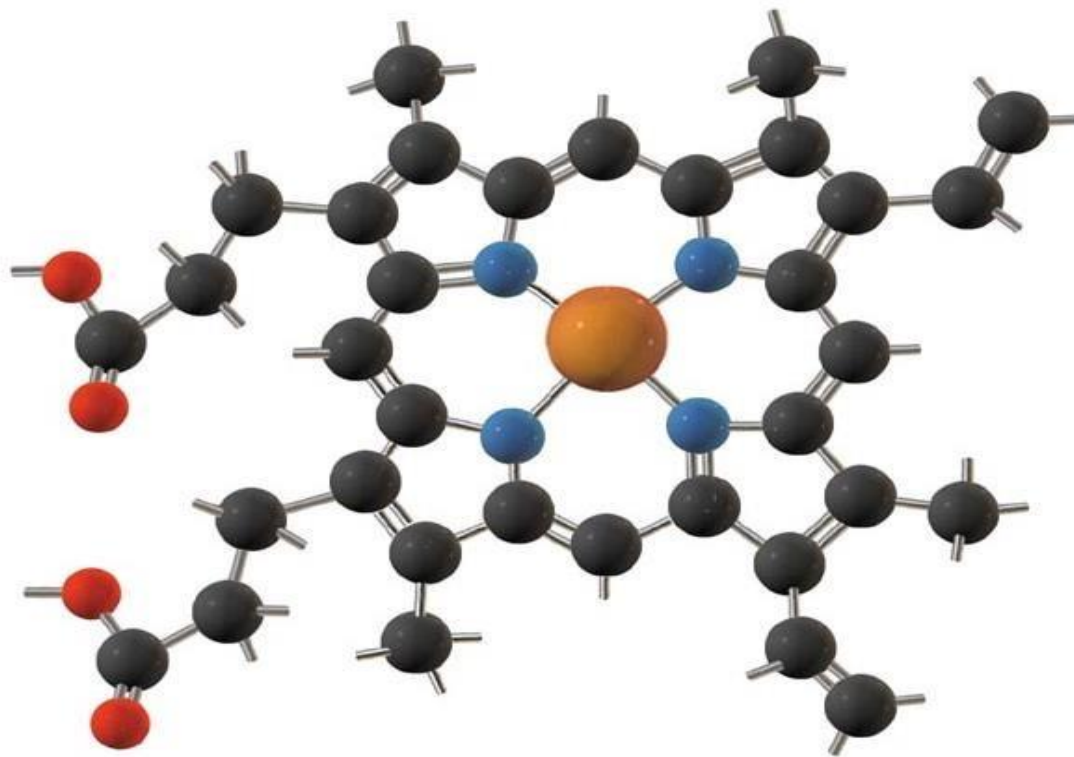
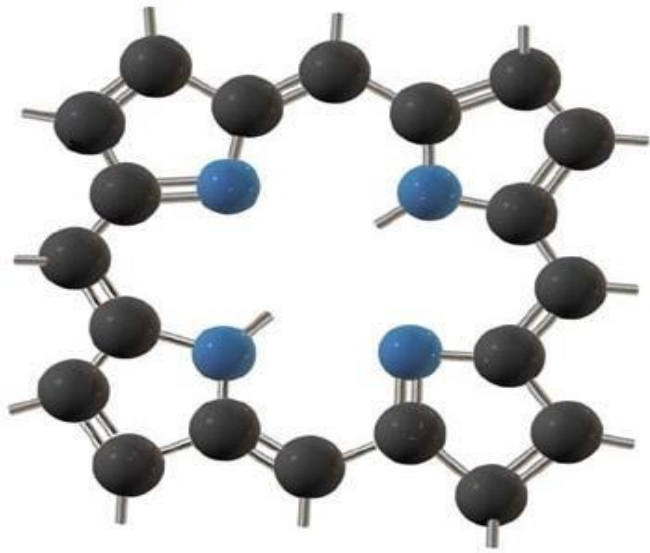
Fumaratlar (fumar kislota tuzlari -  $\text{FeC}_4\text{H}_4\text{O}_2$  - tuzning og'irligi bo'yicha 33% temir.

Fe (III) birikmalari dori shaklida: “**Maltofer**”, “**Ferrum-Lek**”.

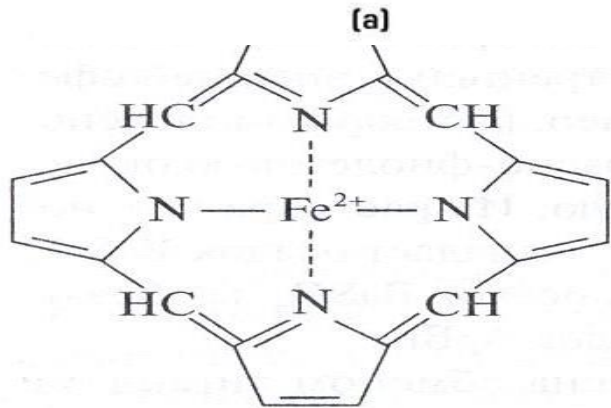
Fe (II) birikmalari quruq dori shaklida: “**Aktiferrin**”, “**Tardiferon**”, “**Ferropleks**”, “**Fenyuls**”.

“**Antiferon**” temirning organik tuzlari sifatida tomchi dori (“**Ferretab**”, “**Ferronal**”, “**Ferlatum**”, “**Xeferol**”) va in'eksiya sifatida “**Totema**”.

# Gemoglobin hosil bo'lishida porfin sikllari (pirrol) ishtirok etadi:



(a)



(b)

**Gem (a) hamda gemoglobin tuzilishi (b)**



# В каких процессах принимает участие железо



## ПРОДУКТЫ, БОГАТЫЕ ЖЕЛЕЗОМ



## Содержание железа в продуктах

Продукт	Мг. На 100 г.
Фасоль	11,0 – 12,4
Горох	8,0 – 9,4
Печень	8,0 – 9,8
Гречневая крупа	7,0 – 8,0
Овсяная крупа	3,5 – 3,9
Мясо говяжье	2,6 – 2,8
Яйцо (1 шт.)	2,6 – 2,7
Хлеб ржаной	2,0 – 2,6
Хлеб пшеничный	0,9 – 2,6
Яблоки	0,5 – 2,2
Абрикосы	1,8 – 2,1
Шоколад	2,0 – 2,7





# ПРОДУКТЫ ПИТАНИЯ БОГАТЫЕ ЖЕЛЕЗОМ

Указано ориентировочное наличие в 100 г продукта:



**Фисташки 60 мг**



**Шпинат 13.51 мкг**



**Чечевица 11.8 мкг**



**Горох 6.8-9.4 мкг**



**Гречка 8.3 мкг**



**Голубь 7.5 мкг**



**Ячневая крупа 7.4 мкг**



**Овсянка 5.5 мкг**



**Пшеница 5.4 мкг**



**Арахис 5 мкг**



**Печень**

**свинина 20,2 мг,  
говядина 7 мг, птица 3 мг**



**Кизил 4.1 мкг**



**Кешью 3.8 мкг**



**Кукуруза 3.7 мкг**



**Кедровые орехи  
3 мкг**

# ИСТОЧНИКИ ЖЕЛЕЗА

## ПРОДУКТ

## СОДЕРЖАНИЕ В 100 Г

Сушеные грибы



Говяжья печень



Какао



Зеленая фасоль



Земляника



Черника



Крольчатина



Говядина

Яйцо



Морковь



35 мг

20 мг

11,7 мг

7,9 мг

7,8 мг

7 мг

4,4 мг

2,5 мг

1,5 мг

0,7 мг



# Продукты питания богатые никелем (Ni)

Указано ориентировочное наличие в 100гр продукта:

**Горох**



247 мкг

**Фасоль**



173 мкг

**Чечевица**



161 мкг

**Кукуруза**



83.8 мкг

**Печень**



63 мкг (говляжья)

**Рис**



51.6 мкг

**Овсянка**



50 мкг

**Фисташки**



40 мкг

**Пшеница**



21-43 мкг

**Абрикос**



30 мкг

**Ячневая крупа**



23.1 мкг

**Яблоко**



17 мкг

**Груша**



17 мкг

**Виноград**



18 мкг

**Капуста  
белокачанная**



15 мкг

# Продукты питания богатые кобальтом (Co)

Указано ориентировочное наличие в 100 гр продукта:

**Кальмар**



95 мкг

**Тунец**



40 мкг

**Треска**



30 мкг

**Сардина**



30 мкг

**Морской окунь**



30 мкг

**Салака**



25 мкг

**Манка**



25 мкг

**Хек**



25 мкг

**Судак**



20 мкг

**Щука**



20 мкг

**Камбала**



20 мкг

**Горбуша**



20 мкг

**Скумбрия**



20 мкг

**Сом**



20 мкг

**Зубатка**



20 мкг