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

3-MA’RUZA:

14-GURUH ELEMENTLARI. UGLEROD GURUHI

Ma’ruza mualliflari:

farm.f.d., prof. To’xtayev X.R.

farm.f.d., prof. Sharipov A.T.

katta o’qituvchi: Jumabayev F.R.

farhodjumaboyev1@gmail.com

TOSHKENT-2023

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REJA:

Mavzuning ma’ruza davomida yoritiladigan qismlari:

1. Guruh elementlarining umumiy tavsifi;
2. Uglerod va uning birikmalari;
3. Kremniy va uning birikmalari;
4. Ge, Sn va Pb birikmalari;
5. 14-guruh elementlarining farmatsiyadagi ahamiyati.

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.

14-guruh elementlarining asosiy kattaliklari

Asosiy kattaliklar	$_{6}^{12}C$	$_{14}^{28}Si$	$_{32}^{73}Ge$	$_{50}^{119}Sn$	$_{82}^{207}Pb$
Atom massasi	12,011	28,08	72,5	118,6	207,2
El.formulasi	$2s^2 2p^2$	$3s^2 3p^2$	$4s^2 4p^2$	$5s^2 5p^2$	$6s^2 6p^2$
Atom radius, nm	0,077	0,117	0,139	0,158	0,175
Suyuq.h, ^oC	3540	1413	958	232	327
Qayn.h, ^oC	4347	2630	2730	2350	1750
Zichligi, g/sm^3	3,54	2,33	5,35	7,28	11,34
Ionlanish. energ.	11,3	8,2	7,9	7,3	7,4
Yer qo'stlog'ida tarqalishi, %	$1*10^{-1}$	27,6	$7*10^{-4}$	$4*10^{-3}$	$1,7*10^{-3}$

Tabiatda uglerod

$MgCO_3$ – magnezit

$MgCO_3 \cdot CaCO_3$ – dolomit

Dolomit kristallari

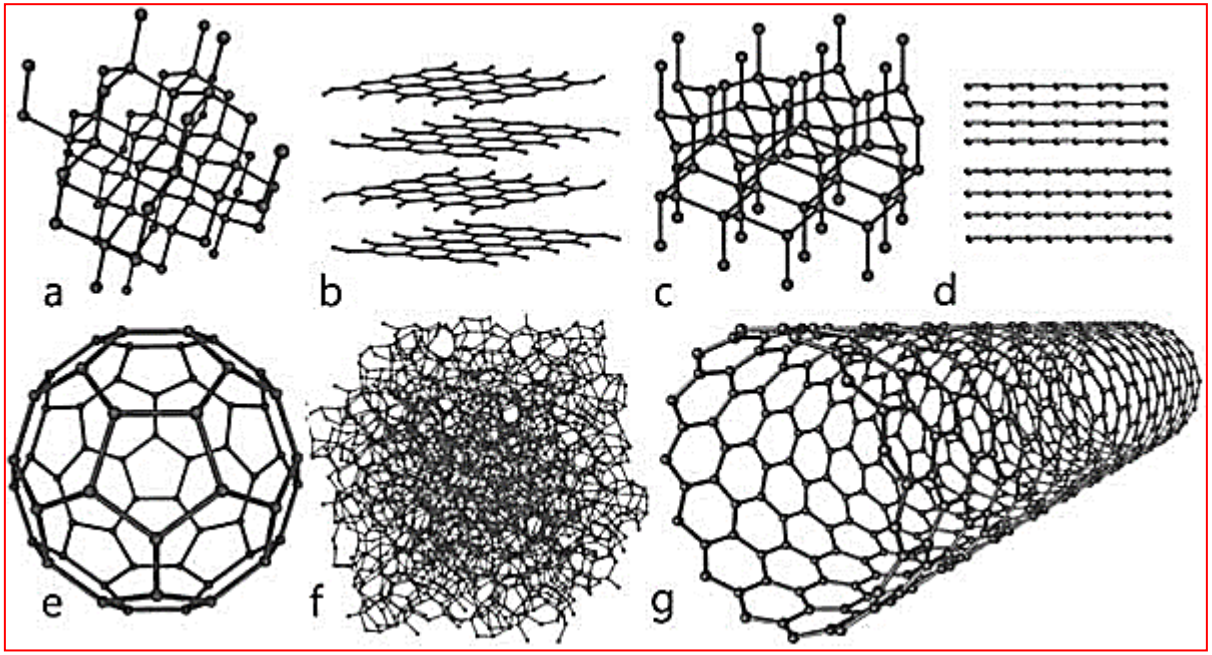
$Na_2CO_3 \cdot 10H_2O$ – soda, $CaCO_3$ – viperit, $FeCO_3$ – temir shpati, $MnCO_3$, $ZnCO_3$ – marganes va rux shpatlar.

$Ca(HCO_3)_2$ va $Mg(HCO_3)_2$ holatida.

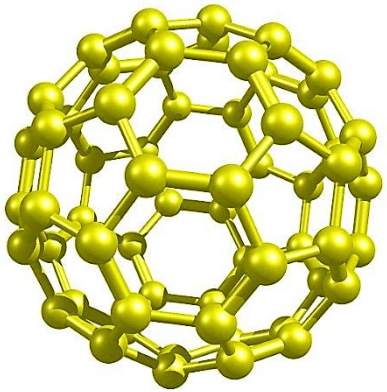
Oqsil, vitamin, yog', neft, tabiiy gaz, ko'mir, antrasen, qo'ng'ir ko'mir.

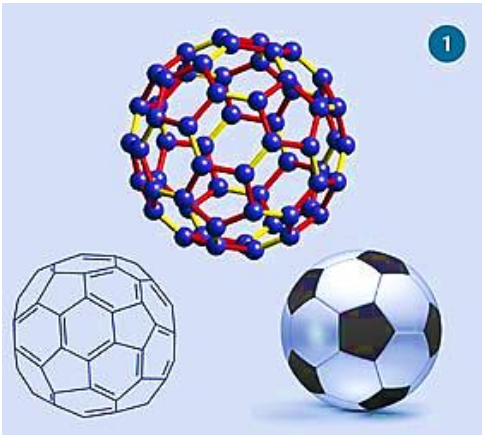
Radiaktiv izotopi: $_7{}^{14}N + {}_0{}^1n = {}_6{}^{14}C + {}_1{}^1H$

Uglerodning allotropik shakllari



- a – olmos,
- b – grafen,
- c – grafit,
- d – karbin,
- e – fulleren,
- f – texnik uglerod,
- g – uglerod nanotrubkalari





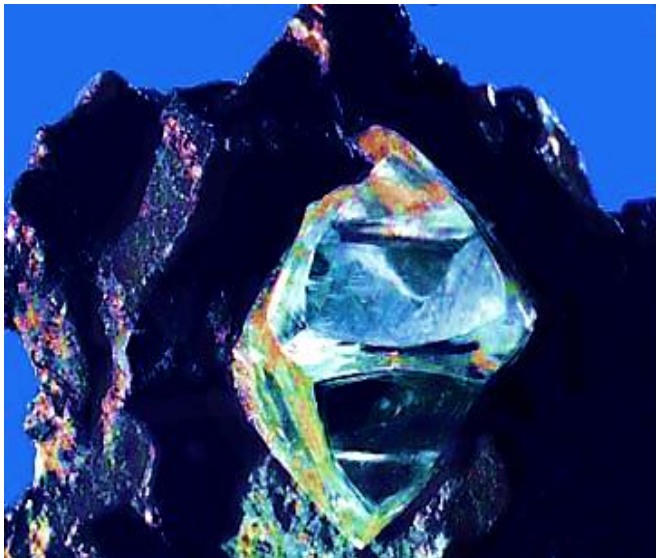
Olmos

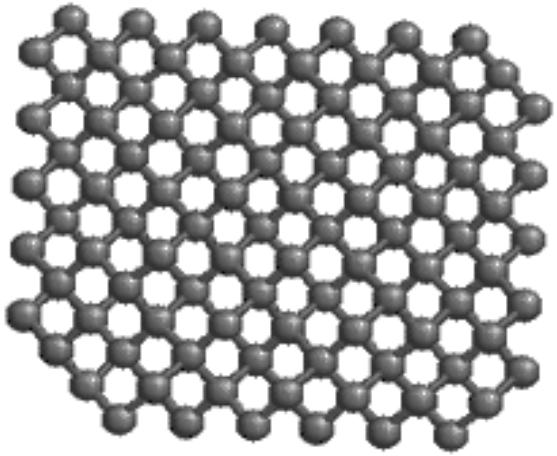
sp^3 gibridlanishga ega rangsiz qattiq kristall.

Uglerod atomi kub kristall panjaraga ega.

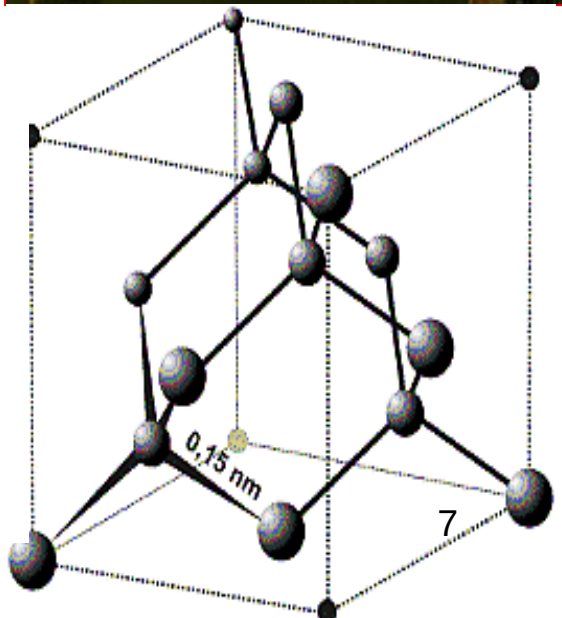
Uglerod atomlari orasidagi masofa 0,154 nm.

Olmosning zichligi 3,5 g/sm^3. Olmos og'irligi karatlarda belgilanadi. (1 karat 0,2 g). Olmos rangli, rangsiz va qora olmosga bo'linadi. Olmosdan metallarni teshishda, burg'ulashda, aniq uskunalar tayoyorlashda foydalaniladi.





Tabiiy olmos



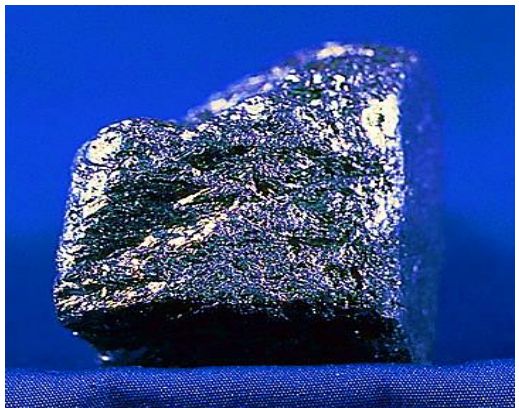
Grafit

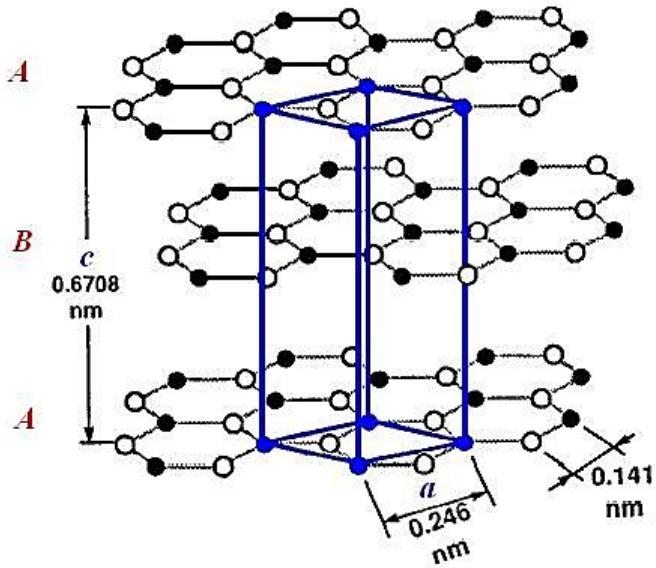
Geksagonal tuzilishli qora modda qavatli tuzilishga ega. Uglerod atomalar sp^2 gibridlangan. C-C orasidagi masofa 0,142 nm, qavatlar orasi 0,689 nm.

Zichligi 2,1-2,5 g/sm^3.

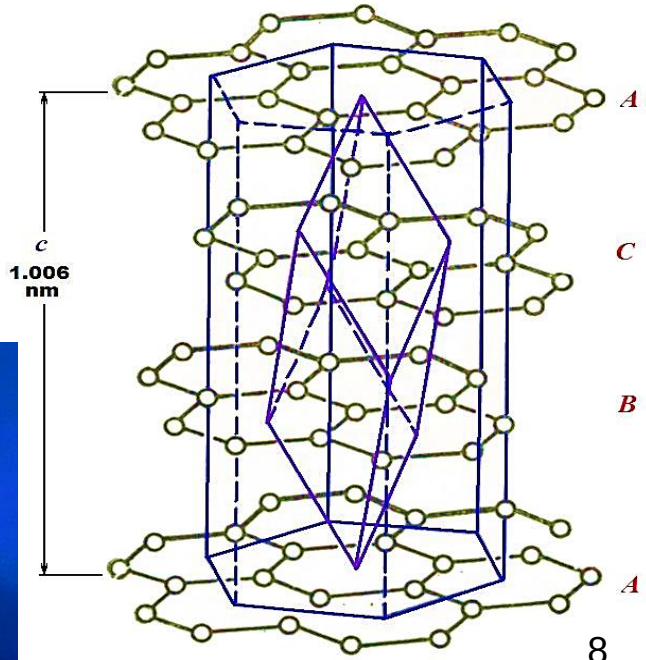
Grafit elektrodlar, yog'lash materiallari, yadro reaktorlarida neytronlarni sekinlashtiruvchi modda.

Grafitdan p=100000 atm 3000 – 3500°C da sun'iy olmos olinadi. U 1000°C da olmos grafitga aylanadi.





α-graphit



β-graphit

Uglerodning kimyoviy xossalari

Olmos – inert modda. Qizdirilganda kislorod, zar suvi bilan tas'irlashadi.

Grafit – olmosga nisbatan faolroq. Amorf ko'mir grafitga qaraganda tezroq reaksiyaga kirishadi.

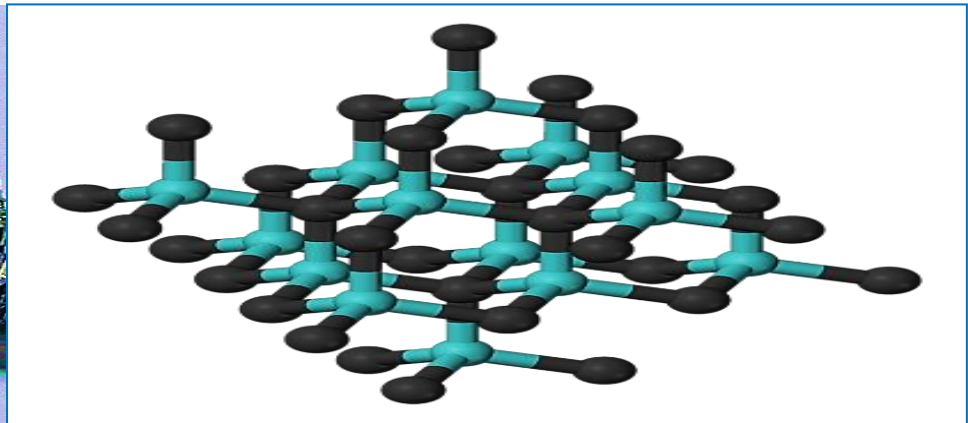
$$2C + O_2 = 2CO \qquad C + O_2 = CO_2 \qquad C + 2H_2 = CH_4$$

CH_4 – tetraedr tuzilishga ega.

S (1000°C), Si (2000°C) va B (2000°C):

$$C + 2S = CS_2; \qquad Si + C = SiC; \qquad 4B + C = B_4C$$

SiC va B_4C – kovalent tabiatga ega, polimer birikma. Juda qattiq, kimyoviy inert modda.



Karbidlar

I-III guruh karbidlari ion bog’ tabiatga ega.

Al_4C_3 $Al \equiv C - Al = C = Al - C \equiv Al$ CaC_2

$$Al_4C_3 + 12H_2O = 4Al(OH)_3\downarrow + 3CH_4\uparrow$$

Al_4C_3 (suyq.h. 2800°C), Be_2C (2150°C) metan hosilalari.

Karbidlar s- va d- elementlar atsetilen hosilalari:

$$CaC_2 + 2H_2O = Ca(OH)_2 + C_2H_2\uparrow$$

Na_2C_2, CaC_2, $Al_2(C_3)_2$, Ag_2C_2 va Cu_2C_2.

d-element karbidlari: MeC (TiC, ZrC, HfC, VC),

Me_2C (Mo_2C, W_2C), Me_3C (Mn_3C, Te_3C, Co_3C).

O’zgaruvchan tarkibli karbidlar - $TiC_{0,6\text{-}1,0}$ yoki $VC_{0,58\text{-}1,0}$.

TiC – 3140°C, Zr_2C – 3530°C, HfC - 3890°C.

MeC – karbidlar olovga chidamli birikmalardir: TiC, VC, NbC,

Uglerodning galogenli birikmalari

CF_4 – gaz, **CCl_4** – suyuqlik, **CBr_4** va **CI_4** – qattiq moddalar.

Olinishi: $SiC + 4F_2 \rightarrow SiF_4 + CF_4$

$CS_2 + 3Cl_2 = CCl_4 + S_2Cl_2$

Uglerod (IV) oksidi. $CaCO_3 + 2HCl = CaCl_2 + CO_2\uparrow + H_2O$

$CaCO_3 = CaO + CO_2$

Karbonat angidrid havodan 1,5 marta og'ir, **CO_2** sovutilganda quruq muzni hosil qiladi. 1 litr suvda 1 litr **CO_2** eriydi.

$CO_2 + H_2O = H_2CO_3$:

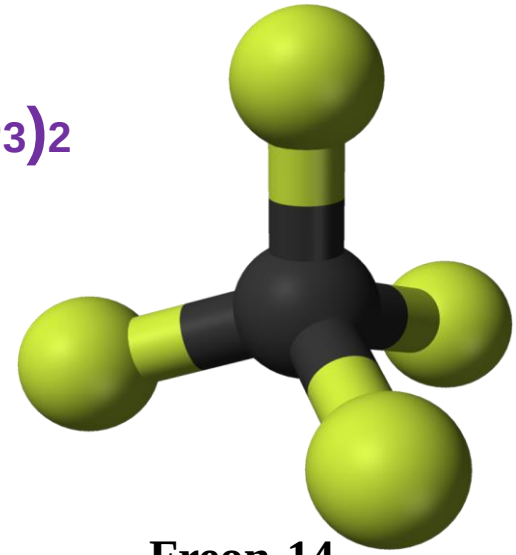
$CaCO_3 + H_2O + CO_2 = Ca(HCO_3)_2$

$NaOH + CO_2 = NaHCO_3$

CO_2 – oksidlovchi:

$Mg + CO_2 = MgO + CO$

$C + CO_2 = 2CO$



Freon-14
CF_4

Karbonat kislota va uning tuzlari

H_2CO_3 – beqaror kislota,

$K_1 = 1{,}31*10^{-4}$, $K_2 = 4{,}84*10^{-11}$

Ortokislota: H_4CO_4 – tuzlari barqaror.

Ichimlik sodasi – $NaHCO_3$, soda – Na_2CO_3, potash – K_2CO_3, ohaktosh, marmar, bo'r – $CaCO_3$.

Soda – kuchli elektrolit. Ca, Sr, Ba, Mg ionlari erimaydigan karbonatlar hosil qiladi:

$$Ba(NO_3)_2 + Na_2CO_3 = BaCO_3\downarrow + 2NaNO_3$$

Bi, Fe va Al karbonatlari va gidrokarbonatlari oson gidrolizlanadi:

$$Al_2(SO_4)_3 + 3Na_2CO_3 + 3H_2O = 2Al(OH)_3\downarrow + 3CO_2\uparrow + 3Na_2SO_4$$

Soda olish usullari 3 xil: Leblan, Solvey va elektrolitik.

Sifat reaksiya: $CO_3^{2-} + 2H^+ \rightarrow CO_2\uparrow + H_2O$

$$HCO_3^- + H^+ \rightarrow CO_2\uparrow + H_2O$$

Karbamid: $CO_2 + 2NH_3 = (NH_2)_2CO + H_2O$

O'g'it, polimerlar va farmatsevtik preparatlar (veronal, lyuminal, gidroperit).

$COCl_2$, CCl_4, COS, CS_2 и H_2CS_3.

Uglerod (II) oksid. Rangsiz, hidsiz gaz. Suyuq.h. - 205°C. Zaharli. Is gazi nomini olgan. **CO** **C ≡ O.**

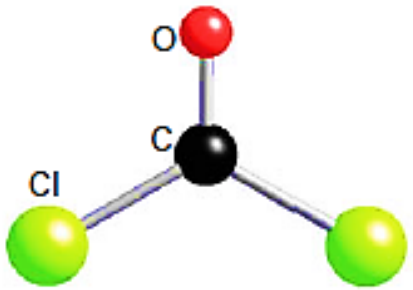
$$NaOH + CO = HCOONa$$

CO – kuchli qaytaruvchi:

$$2CO + O_2 = 2CO_2$$

$$CO + Cl_2 = COCl_2$$

$$CO + NiO = CO_2 + Ni$$



9 Phosgene, $OCCl_2$

CO – suv bug'i bilan:

$$CO + H_2O = CO_2 + H_2$$

$$CO + PdCl_2 + H_2O = CO_2 + Pd + 2HCl$$

Kuchli oksidlovchi:

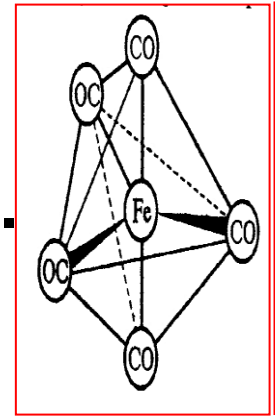
$$3H_2 + CO = CH_4 + H_2O$$

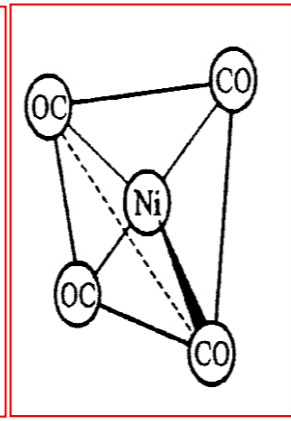
$$2H_2 + CO = CH_3OH$$ (300 - 600°C, p – 500 atm.)

Disproportsiyalanish:

$$CO + CO = C + CO_2$$

Uglerod (II) oksid





CO – ligand. Karbonillar: $[Fe(CO)_5]$, $[Ni(CO)_4]$.

CO olinishi:

$$HCOOH = CO + H_2O$$

$$K_4[Fe(CN)_6]+6H_2SO_4+6H_2O=2K_2SO_4+FeSO_4+3(NH_4)_2SO_4+6CO$$

CO generator gazi, suv gazi va aralash gazlar:

1. Generator gazi. Toshko'mir chala yonganda.

25% CO, 70% N_2, 4% CO_2, qolganlari CH_4, H_2, O_2.

Q = 3347 – 4602 kJ/mol.

2. Suv gazi. Cho'g' ko'mir ustidan suv bug'i o'tkazib:

$$C + H_2O = CO + H_2 \qquad CO + H_2O = CO_2 + H_2$$

3. Aralash gaz. Cho'g' holdagi ko'mirning ustidan havo va suv bug'i:

Tarkibi: 30 % CO, 15 % H_2, 5 % CO_2, 50 % N_2.

Q = 5440 kJ/mol.

CO – chumoli k-ta, fosgen, metanol, sun'iy benzin olishda qo'llaniladi.

Disian:

Disian: $C{=}N{-}N{=}C$

Rangsiz, achchiq bodom hidli, zaharli gaz. Suvda, efirda spirtlarda yaxshi eriydi.

$$2C + N_2 = (CN)_2$$

Olinishi: **350-450°C da simob sianidni parchalab:**

$$Hg(CN)_2 = Hg + (CN)_2$$

Xossalari.

Disian gidrolizlanganda: $(CN)_2 + H_2O = HCN + HCNO$

$$(CN)_2 + 4H_2O = (NH_4)_2C_2O_4$$

Ammoniy oksalat

$$(CN)_2 + 2NaOH = NaCN + NaCNO + H_2O$$

Qaytaruvchi: $(CN)_2 + Cl_2 = 2CNCl$; Cl_2 **yoki** $KMnO_4$, Br_2

Oksidlovchi: $H_2 + (CN)_2 = 2HCN$

$$2Na + (CN)_2 = 2NaCN$$

Sianid kislota

HCN – rangsiz, achchiq bodom hidli suyuqlik, kuchli zahar.

$$H\text{-}C\equiv N \leftrightarrow H\text{-}N=C$$

$$HCN \leftrightarrow H^+ + CN^- \qquad K = 7{,}9*10^{-10}.$$

Ammoniy formiat: $HCN + 2H_2O = HCOONH_4$

HCN va uning tuzlari qaytaruvchilardir:

$$KCN + Cl_2 + 2KOH = KCNO + 2KCl + H_2O$$

$$KCN + S = KCNS$$

$$CaCN_2 + C + Na_2CO_3 = 2NaCN + CaCO_3$$

Lab-da:

$$3C + N_2 + BaO = CO + Ba(CN)_2$$

$$Ba(CN)_2 + H_2SO_4 = 2HCN + BaSO_4\downarrow$$

Texnikada:

$$CO + NH_3 = HCN + H_2O$$

KCN va NaCN, eruvchan tuzlari Ag va Au olishda foydalaniladi.

CN^- ligand sifatida: $K[Ag(CN)_2]$, $K_3[Fe(CN)_6]$, $K_4[Fe(CN)_6]$.

Sianat kislota

HCNO – birikmalari sianatlar. ($k=1,2*10^{-4}$)

$$H\text{-}\ddot{O}\text{-}C \equiv N \leftrightarrow H\text{-}N{=}C{=}\ddot{O}$$

$Hg(CNO)_2$ – detonator.

Rodanid kislotasi.

(HCNS) ↔ H-S-C≡N, yog'simon, suvda eriydigan kuchli kislota (K=0,14).

$$2NH_3 + CS_2 = NH_4CNS + H_2S$$

Rodanid tuzlari: KCNS, NaCNS, NH_4CNS.

Olinishi: $KCN + S = KCNS$

Fe^{3+} – ioni uchun sifat reaksiya (to'q qizil):

$$Fe^{3+} + 6CNS^- = [Fe(CNS)_6]^{3-}$$

Simob rodanid - $Hg(CNS)_2$

$$Hg(NO_3)_2 + 2KCNS = Hg(CNS)_2\downarrow + 2KNO_3$$

$Hg(CNS)_2$ – fira'vn iloni.

Yonganida gazlar hosil bo'lib kengayish:

$$2Hg(CNS)_2 + 9O_2 = 2HgO + 4CO_2 + 2N_2 + 4SO_2$$

Sianamid kislota:

$$CaC_2 + N_2 = CaCN_2 + C$$

H_2CN_2 – rangsiz kristall modda, suvda eriydi.

$$H\text{-}N{=}C{=}N\text{-}H \quad \leftrightarrow \quad H_2N\text{-}C{\equiv}N$$

Gidrolizlanganda:

$$H_2CN_2 + 3H_2O = 2NH_3 + H_2CO_3$$

Uglerodning tibbiyotdagi ahamiyati

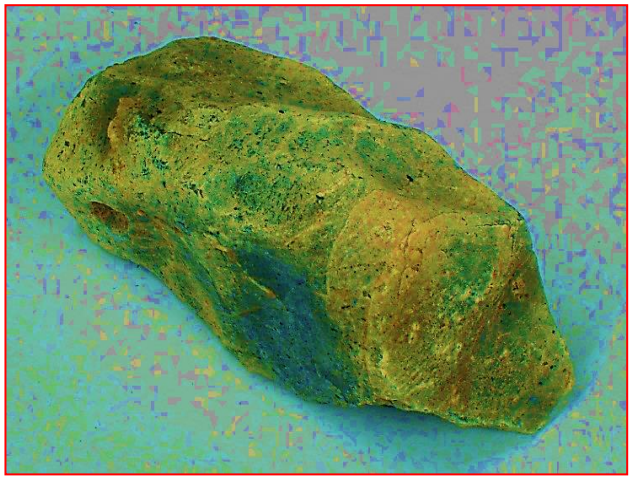
- ✓ **C ning H, O, N, P va S bilan birikmalari tirik to’qimalarning asosidir.**
- ✓ **Tananing 16 kg C dan iborat (70 kg).**
- ✓ **Havoda C 0,03 %, agar 10% ortsa, inson halok bo’ladi.**
- ✓ **CO – is gazi, kuchli zahar bo’lib, gemoglobin bilan karboksogemoglobin hosil qiladi.**
- ✓ **Havoda CO 1% dan ortsa, inson halok bo’ladi.**
- ✓ **HCN – zahar, uning 0,05 g insonni o’ldiradi.**
- ✓ **HCN tuzlari zaharli. Sianidlar oz miqdorda danaklar mag’zida (achchiq bodom, olxo’ri, olcha va shaftoli) uchraydi.**
- ✓ **$NaHCO_3$ tabletkalar olishda yordamchi modda.**

Kremniyning tabiatda tarqalgan birikmalari

$Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$ – kaolin

$nSiO_2$ – kvars

$KAlSi_3O_8$ – ortoklaz



$NaAlSiO_4$ – nefelin

$Mg_3Si_2O_7 \cdot 2H_2O$ – asbest

$NaAlSi_2O_8$ – albast

Kremniyning fizik xossalari va olinishi

Fizik xossalari. **Kristall va amorf holda uchraydi.**

Kristall Si – to'q-kulrang, yaltiroq (suyuql. h. 1423°C), elektr toki o'tkazadi.

Amorf Si – mo'rt, qo'ng'ir kukun, kimyoviy faol.

Olinishi: $SiO_2 + 2Mg = 2MgO + Si$

$SiCl_4 + 2Zn = 2ZnCl_2 + Si$

Toza kremniy: $SiCl_4 + 2H_2 = Si + 4HCl$

Kremniyning kimyoviy xossalari

$2Si + O_2 = 2SiO$ $Si + O_2 = SiO_2$

$Si + 2F_2 = SiF_4$ $Si + 2Cl_2 = SiCl_4$

(1000°C) azot: $3Si + 2N_2 = Si_3N_4$

Bor bilan: **SiB_3, SiB_6**.

(2000°C) **SiC** (korborund). **SiC** d=3,17 qattiqligi olmosga yaqin, (suyuql.h. 1830°C).

$$Si + 2NaOH + H_2O = Na_2SiO_3 + 2H_2\uparrow$$

HF da eriydi:

$$3Si + 4HNO_3 + 18HF = 3H_2[SiF_6] + 4NO\uparrow + 8H_2O$$

$H_2[SiF_6]$ – geksaftorsilikat kislota.

$$2Mg + Si = Mg_2Si$$

Ca, Fe, Cu, Bi – lar bilan silitsidlar.

O'zgaruvchan tarkibli: Mo_3Si, MoSi, $MoSi_2$.

d-elementlar karbidlari qiyin suyuqlanuvchan:

WSi_2 (2165°C), $MoSi_2$ (2050°C), V_5Si_3 (2150°C), Ti_5Si_3 (2120°C).

$$Si + 3H_2O = H_2SiO_3 + 2H_2\uparrow$$

Kremniyning vodorodli birikmalari

Kremniyning vodorodli birikmalari – Si_nH_{2n+2}.

C-C bog'lanish energiyasi – 347,69 kJ/mol

Si-Si bog'lanish energiyasi – 174,56 kJ/mol

$$Ca_2Si + 4HCl = 2CaCl_2 + SiH_4\uparrow$$

SiH_4 – silan, badboy hidli gaz, beqaror: $SiH_4 = Si + 2H_2$

$$SiH_4 + 2O_2 = SiO_2 + 2H_2O$$

O'z-o'zidan yonadi - 191°C. $SiH_4 + 2H_2O = SiO_2 + 4H_2$

Silan xlor bilan, portlab: $SiH_4 + 4Cl_2 = SiCl_4 + 4HCl$

$$SiH_4 + 8AgNO_3 + 4H_2O = H_4SiO_4 + 8Ag + 8HNO_3$$

Kremniyning galogenli hosilalari:

SiF_4 olinishi: $SiO_2 + 4HF = SiF_4 + 2H_2O$

SiF_4 oson gidrolizlanadi: $SiF_4+4H_2O= H_4SiO_4+4HF$

Kompleks birikmalari: $CaF_2+SiO_2+4HF=Ca[SiF_6]+2H_2O$

$SiCl_4$ olinishi: $SiO_2+2C+2Cl_2=SiCl_4+2CO$

$SiCl_4$ – rangsiz suyuqlik: $SiCl_4+4H_2O=H_4SiO_4+4HCl$

$SiBr_4$ - (suyuql.h. 5,2°C) va SiI_4 - (suyuql.h. 120,5° C) qattiq moddalar. Si galogenli hosilalari gidrolizga oson uchragani uchun tutab turadi.

Kremniyning kislorodli birikmalari

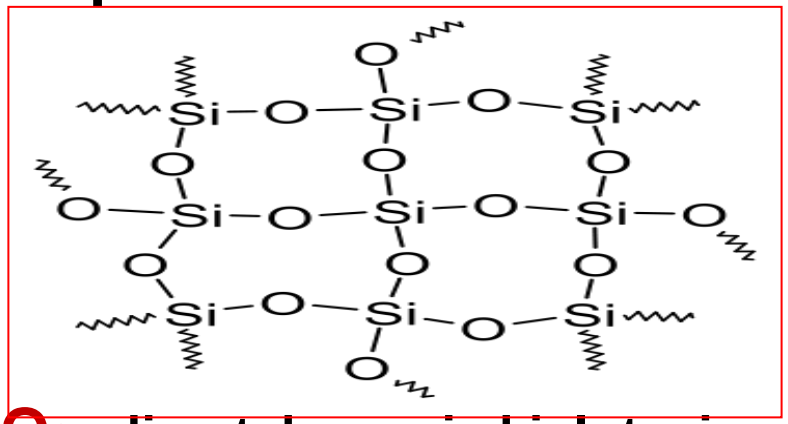
SiO va SiO_2 (1710°C) kvars, kristallobolit, kizelgur.

$$2NaOH + SiO_2 = Na_2SiO_3 + H_2O$$

Na_2SiO_3 va K_2SiO_3 – eruvchan shisha.

SiO_2 sement, shisha, fosfor ishlab chiqarishda.

H_2SiO_3 – metakremniy kislotasi.



$$Na_2SiO_3 + 2HOH = NaHSiO_3 + NaOH$$

$$2NaHSiO_3 = Na_2Si_2O_5 + HOH$$

$$H_2SiO_3 + 4HF = 3H_2O + SiF_4$$

$$2HF + SiF_4 = H_2[SiF_6]$$

$2H_2SiO_3 = H_2Si_2O_5 + H_2O$ $H_2O \cdot 2SiO_2$ **dimetakremniy kislotasi**

$3H_2SiO_3 = H_2Si_3O_7 + 2H_2O$ $H_2O \cdot 3SiO_2$ **trimetakremniy kislotasi**

$2H_4SiO_4 = H_6Si_2O_7 + H_2O$ $3H_2O \cdot 2SiO_2$ **diortokremniy kislotasi**

Shisha:

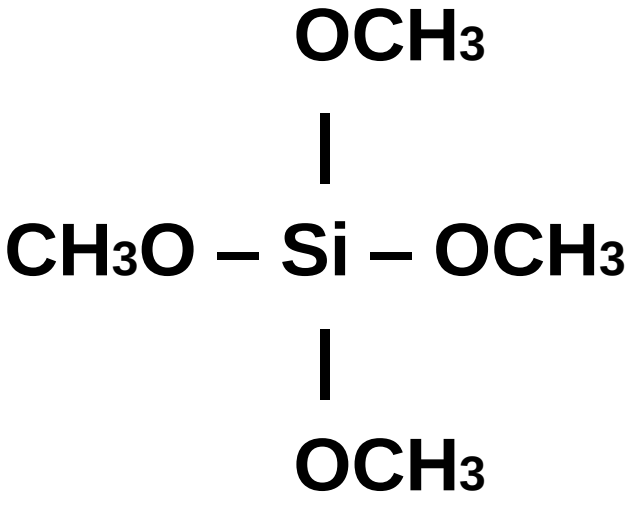
$$Na_2CO_3 + CaCO_3 + 6SiO_2 = Na_2O*CaO*6SiO_2 + 2CO_2\uparrow$$

Na_2CO_3 o’rniga – potash, qiyin suyuqlanuvchan shisha.

SiO_2, K_2CO_3 va PbO – billiur shisha.

Kremniy organik birikmalar

1936-yil rus olimi K.A.Andrianov:



Ortokremniy kislotasining tetrametilefiri

Gidrolizlab tarkibida gidroksil guruhlari tutgan birikmalar olingan.

-Si-O-Si- suyuqlik, bog'lar ko'p takrorlanganda silicon kauchuklar.

Germaniy va uning birikmalari

Germaniy (Germanium). Ge 1886-yil. Vinkler.
Ge, Sn, Pb – qatorida metallic xossasi ortib boradi.
Argirodit – $4Ag_2S*GeS_2$ yoki Ag_8GeS_6.
Germanit – $Cu_3(Fe,Ge)S_4$.

$$Ge + 2Cl_2 = GeCl_4 \qquad GeCl_4 + 2H_2O = GeO_2 + 4HCl$$

$$GeO_2 + 2C = Ge + 2CO$$

Mo'rt, kumushsimon-oq metall, yarim o'tkazgich.
Ge – suyultirilgan. HCl va H_2SO_4 ta'sirlashmaydi.
Konsentrlangan HNO_3 bilan:

$$Ge + 4HNO_3 = H_2GeO_3 + 4NO_2 + H_2O$$

Kons. H_2SO_4: $Ge + 4H_2SO_4 = Ge(SO_4)_2 + 2SO_2\uparrow + 4H_2O$

H_2O_2 da: $Ge + 2NaOH + 2H_2O_2 = Na_2[Ge(OH)_6]$

GeH_4 – german. U rangsiz gaz. $GeCl_4$, $GeBr_4$,GeI_4.
$Ge(OH)_4$ – amfoter. H_2GeO_3, Me_2GeO_3.
GeS_2 – sariq rangli. Ge radiotexnikada yarim o'tkazgich sifatida.

Qalay va uning birikmalari

Qalaytosh (SnO_2). $SnO_2 + 2C = Sn + 2CO$

Sn – suyuql.h. 231°C. Havo va O_2 bilan oksidlanmaydi.

Suv bilan ta'sirlashmaydi. Qaynoq HCl qalayni eritadi:

$$Sn + 2HCl = SnCl_2 + H_2$$

$Sn(OH)_2$ – oq rangli. Tuzlari: stannitlar – Na_2SnO_2.

Kons. HNO_3: $Sn + 4HNO_3 = H_2SnO_3 + 4NO_2 + H_2O$

Oq kukun β-qalay kislota U kislota va ishqorlarda erimaydi.

α-qalay kislota – $SnCl_4$ ga NH_4OH ta'sir ettirilib olinadi:

$$SnCl_4 + 4NH_4OH = H_2SnO_3 + 4NH_4Cl + H_2O$$

α-qalay kislota kons. HCl va ishqorda eriydi:

$$H_2SnO_3 + 4HCl = SnCl_4 + 3H_2O$$

$$H_2SnO_3 + 2NaOH + H_2O = Na_2[Sn(OH)_6]$$

Qaynoq kislotalar: $Sn + 4H_2SO_4 = Sn(SO_4)_2 + 2SO_2 + 4H_2O$

Stannitlar: $Sn + 2NaOH = Na_2SnO_2 + H_2$

Qalay gidrid SnH_4 (stannan) – juda zaharli, beqaror gaz.

Qalay va uning birikmalari

SnO_2 (oq rangli). **$SnCl_2$**: **$K[SnCl_3]$, K_2SnCl_4]**.

SnO va **$Sn(OH)_2$** – amfoter, gidroksistannatlar: **$Na_2[Sn(OH)_4]$.**

$SnCl_2$ va **$Na_2[Sn(OH)_4]$** – kuchli qaytaruvchilar:

$$3Na_2[Sn(OH)_4]+2Bi(NO_3)_3+6NaOH=2Bi\downarrow+3Na_2[Sn(OH)_6]+6NaNO_3$$

Qalay sulfidi – qoramtir-jigarrang modda (**SnS**) tiostannatlarga:

$$SnS + (NH_4)_2S_2 = SnS_2 + (NH_4)_2S; \quad SnS_2 + (NH_4)_2S = (NH_4)_2SnS_3$$

oltin hal (oltin rang bo'yoq)

K_2SnO_3, K_4SnO_4 – eriydigan, oson gidrolizlanadi.

SnO_2 – ishqorlarda eriydi gidroksostannatlar:

$$SnO_2 + 2NaOH + 2H_2O = Na_2[Sn(OH)_6];$$

$$Sn(OH)_4 + 2NaOH = Na_2[Sn(OH)_6]$$

$Sn(OH)_4$ – amfoter modda, asos xossalari ustun.

$SnCl_4$ – havoda tutaydigan suyuqlik:

$$SnCl_4 + 3H_2O = H_2SnO_3 + 4HCl$$

$$SnCl_4 + 2HCl = H_2[SnCl_6];$$

Kompleks tuzlari – $Na_2[SnCl_6]$ va **$(NH4)_2[SnCl_6]$**

Qo’rg’oshin va uning birikmalari

Qo’rg’oshin yaltirog’i – **PbS**, aglezit – **$PbSO_4$**, krokoit – **$PbCrO_4$**, serrussit – **$PbCO_3$**.

$$2PbS + 3O_2 = 2PbO + 2SO_2$$

$$PbO + C = Pb + CO$$

Kulrang tusli metall, suyuql.h. 327ºC.

Kons.H_2SO_4 va Pb ta’sirida – **$Pb(HSO_4)_2$**.

$$3Pb + 8HNO_3 = 3Pb(NO_3)_2 + 2NO + 4H_2O$$

Pb atsetati: $2Pb + 4CH_3COOH + O_2 = 2Pb(CH_3COO)_2 + 2H_2O$

Pb qaynoq ishqorlarda erib, gidroksiplumbatlar hosil qiladi:

$$Pb + 2NaOH + 2H_2O = Na_2[Pb(OH)_4] + H_2$$

PbO – sariq modda. $Pb(OH)_2$ – oq rangli.

Galogenidlari: PbF_2, $PbCl_2$, $PbBr_2$, PbI_2 oz eriydi.

$Pb(CH_3COO)_2$ – “qo’rg’oshin shakari”.

$$Pb(OH)_2 + 4NaOH = Na_4[Pb(OH)_6]$$

Plumbitlar: $Pb(OH)_2 + 2NaOH = Na_2PbO_2 + 2H_2O$

Qo’rg’oshin va uning birikmalari

Pb (II): $PbCl_2$, PbI_2, $PbSO_4$, PbS va $Pb(CH_3COO)_2$.

Pb (IV): PbO_2 – qora-qo’ng’ir, beqaror.

PbO_2 – amfoter. PbH_4 (plumban) beqaror.

Plumbatlar: $Na_2O + PbO_2 = Na_2PbO_3$

$$PbO_2 + 4HCl = PbCl_2 + Cl_2 + 2H_2O$$

PbF_4 – barqaror, komplekslari: $PbF_4+2KF=K_2[PbF_6]$

PbO_2 – kuchli oksidlovchi:

$$5PbO_2 + 2MnSO_4 + 3H_2SO_4 = 5PbSO_4 + 2HMnO_4 + 2H_2O$$

Surik – Pb_3O_4 (zarg’aldoq-qizil kukun) va H_4PbO_4 (Pb_2PbO_4).

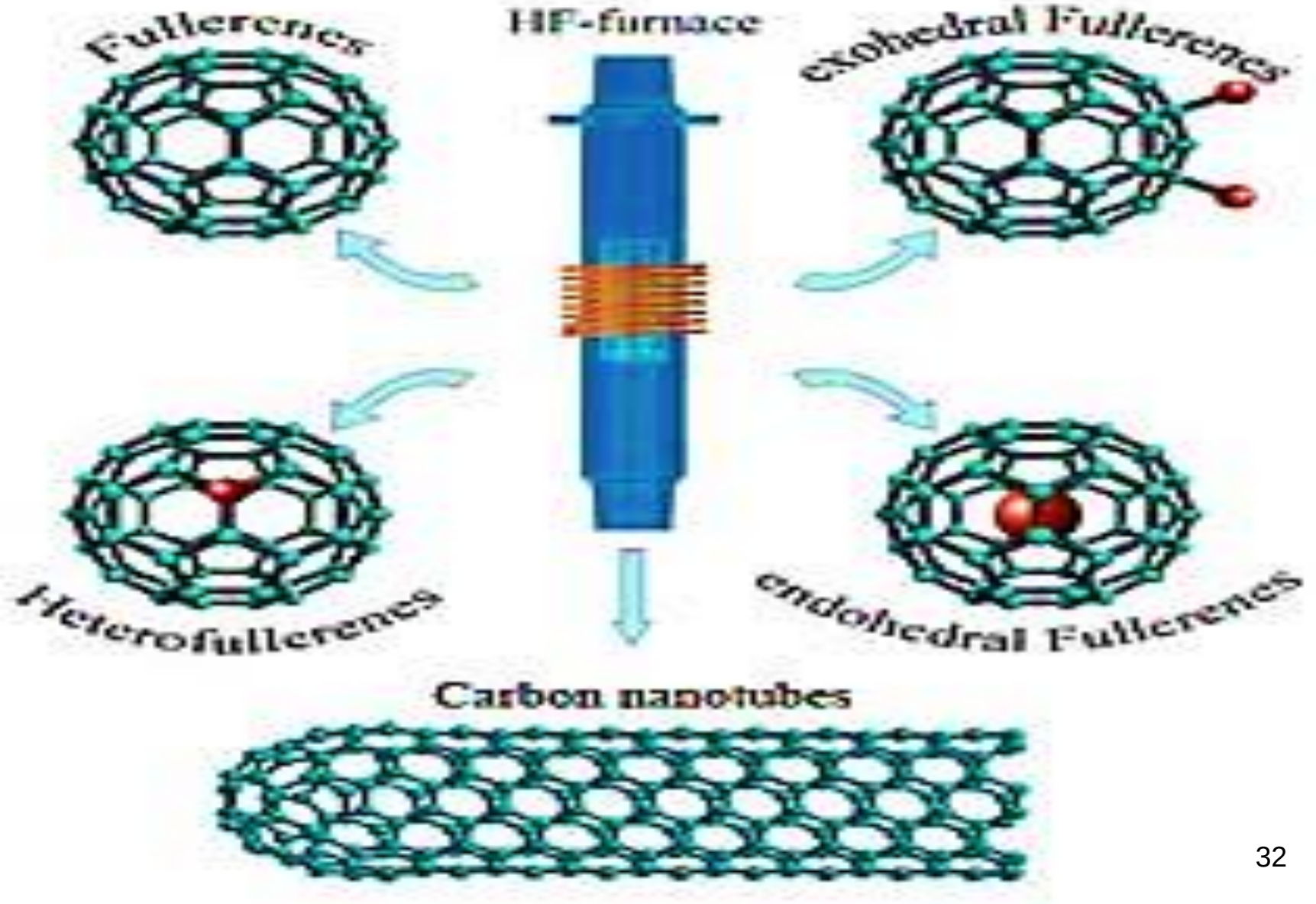
$$2KI + Pb_3O_4 + 8CH_3COOH = 2CH_3COOK + J_2 + 3Pb(CH_3COO)_2 + 4H_2O$$

$$Pb(CH_3COO)_2 + Cl_2 + 4KOH = PbO_2 + 2KCl + 2CH_3COOK + 2H_2O$$

Qo’rg’oshin va uning birikmalari

- **PbO – billur shisha.**
- **$PbCrO_4$ – sariq bo’yoq.**
- **Tetraetil qo’rg’oshin – $[Pb(C_2H_5)_4]$. 200 ^oC da** qaynaydigan suyuqlik, zaharli,
- **Pb (II) birikmalari zaharli.**
- **Pb birikmalari nerv-tomir tizimiga va qonga ta’sir qiladi, zahar. Toksik ta’sir mexanizmi murakkab.**
- **Pb^{2+} kuchli kompleks hosil qilish xossasiga ega. U bioligandlar bilan mustahkam komplekslar hosil qiladi.**
- **Organizmda qo’rg’oshin miqdori juda oz (10^{-6} %).**
- **Organizmda qalay 10 mg, u suyuk, jigar va o’pka to’qimalarida uchraydi.**

Nanokimyo


Fullerenes
HF-furnace
exohedral Fullerenes
Heterofullerenes
endohedral Fullerenes
Carbon nanotubes

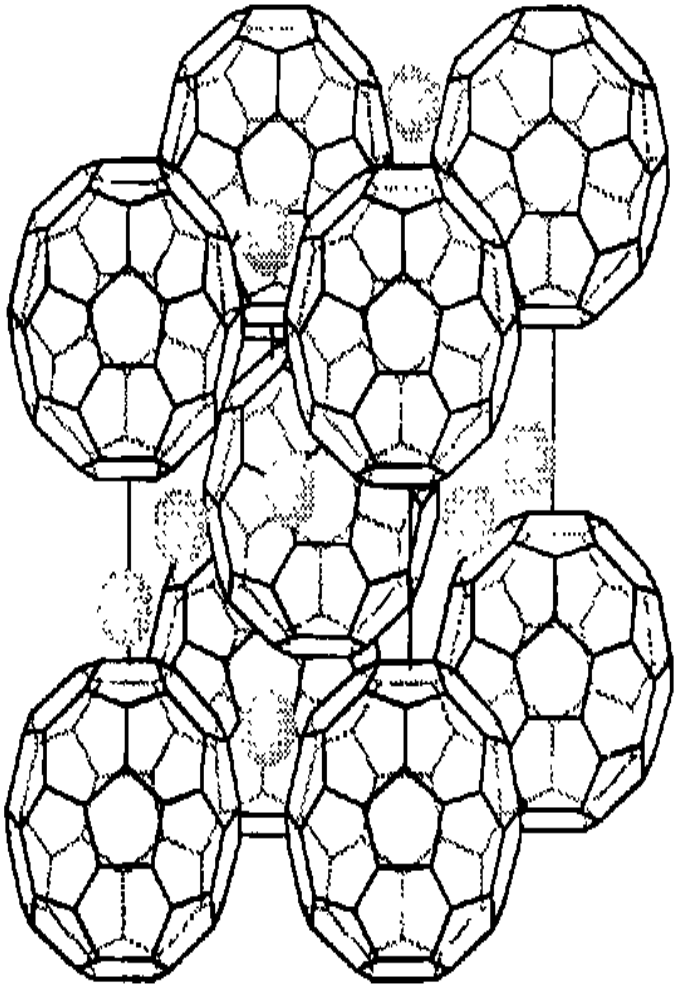
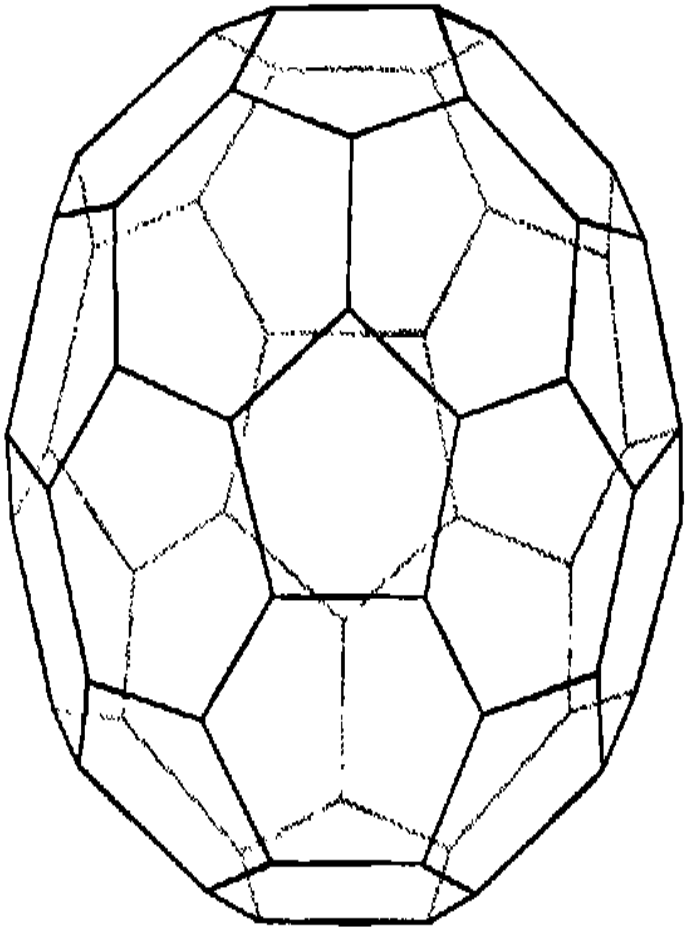
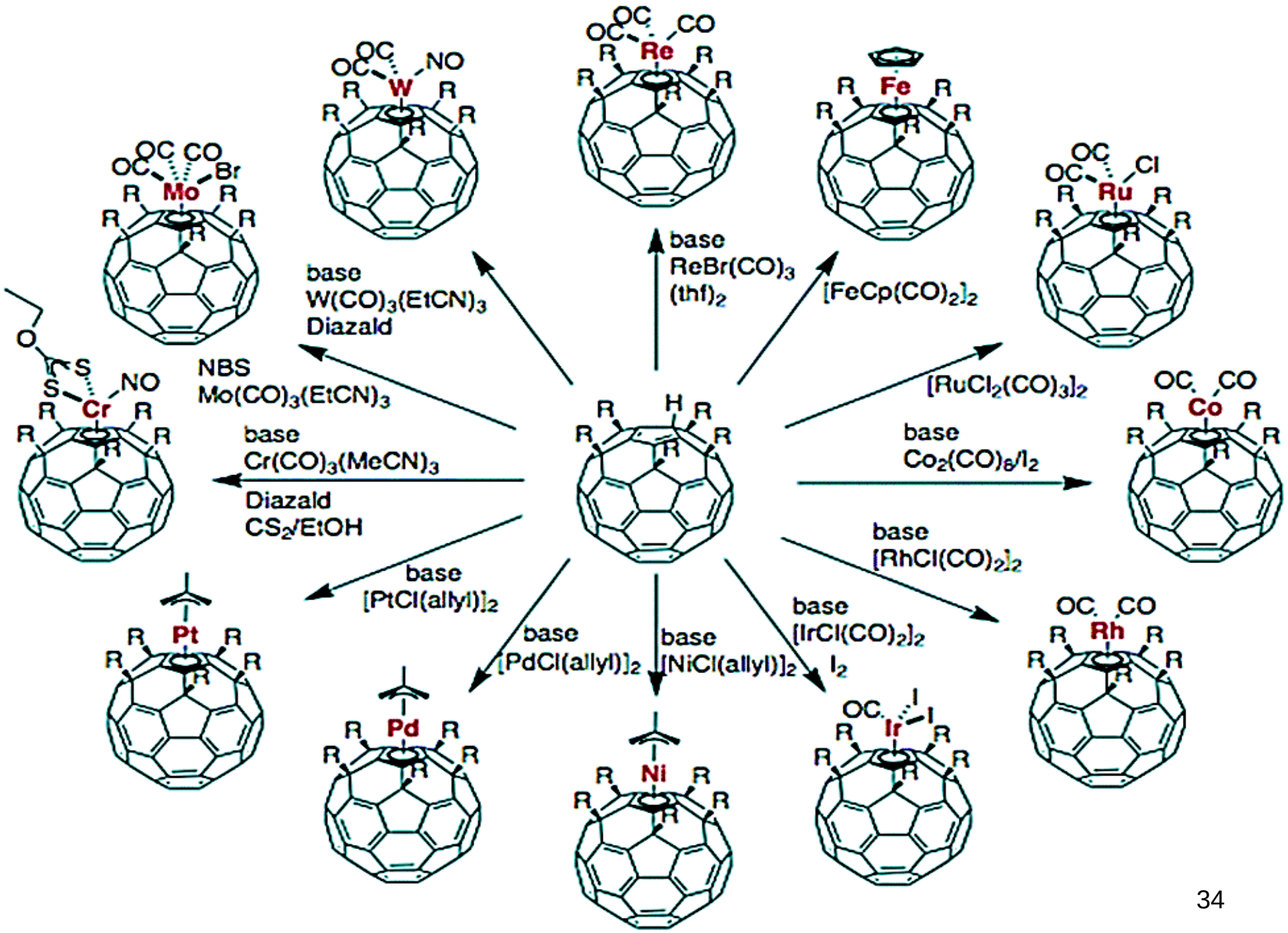


Рис. 10.19. ГЦК структура K_3C_{60}. Показан только фрагмент элементарной ячейки.



29 C_{60}


base
W(CO)3(EtCN)3
Diazald
base
ReBr(CO)3
(thf)2
[FeCp(CO)2]2
NBS
Mo(CO)3(EtCN)3
[RuCl2(CO)3]2
base
Cr(CO)3(MeCN)3
Diazald
CS2/EtOH
base
Co2(CO)8/I2
base
[PtCl(allyl)]2
base
[RhCl(CO)2]2
base
[PdCl(allyl)]2
base
[NiCl(allyl)]2
base
[IrCl(CO)2]2
I2