

- **3 SKUPINA** - skupina skandija
 - - Lantanoidi
 - - Aktinidi

Sc	Y	La-Lu	Ac-Lr
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- $E_i \approx 20 \text{ eV}$
- $\chi \quad 1,3 \quad 1,1 \quad \approx 1,1$
- $E^0 (M^{3+}/M) = -2 \text{ V}$
- $-2,5 \text{ V}$
- pretežno ionski spojevi : M^{3+}

- Minerali : $\text{Sc}_2\text{Si}_2\text{O}_7$ Tortvertit
- Y s teškim lantanidima
- La s lakim lantanidima

- Dobivanje. Elektroliza taline klorida
- Lantanoidi
- Parni redni broj $6s^2 5d^1 4f \dots$
- $6s^2 5d^0 4f^7$ ili $4f^{14}$

- HARKINS-OVO pravilo
- Niže talište → Eu Yb
- Veći atomski volumen

● PERIODIČNOST PROMJENE BOJE IONA

● La^{3+}	Ce^{3+}	Pr^{3+}	Nd^{3+}	Eu^{2+}
● bezbojni	žutozelen	crvenoljubičast	bezbojan	
● Dy^{3+}		Er^{3+}	Tm^{3+}	Lu
● žutozelen		tamnoružičast	svjetlozelen	bezbojan
●				

- **Oksidacijski broj:**
većina

III



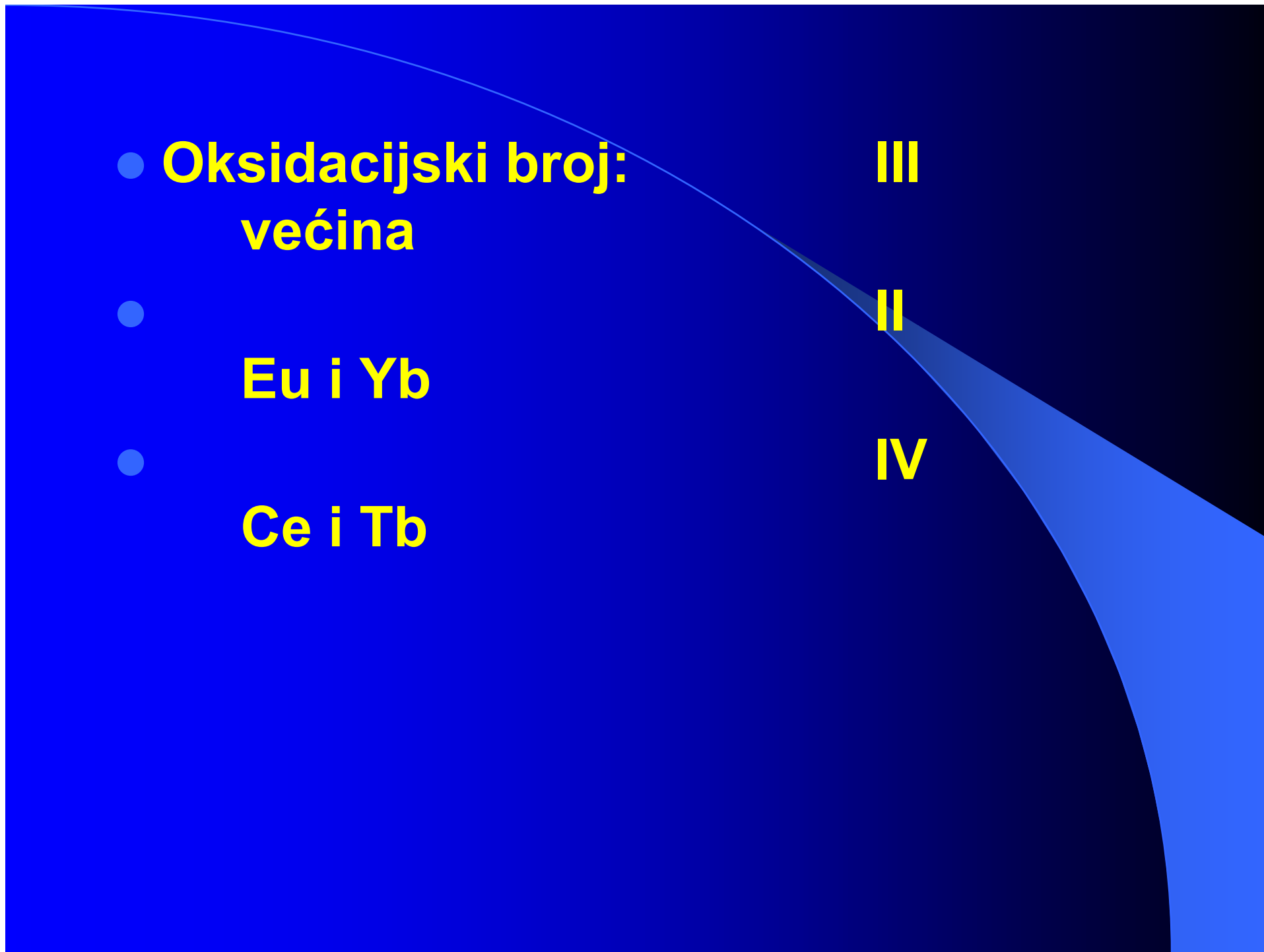
Eu i Yb

II



Ce i Tb

IV



Odvajanje

Monacitni pijesak (Ce, La, Nd, Pr) PO₄
(Gd.....Ln) PO₄
+ SiO₂, ThO₂, TiO₂



otopina



grijanje ↓



otopina

Lakše topljivi

Y i teški lantanidi

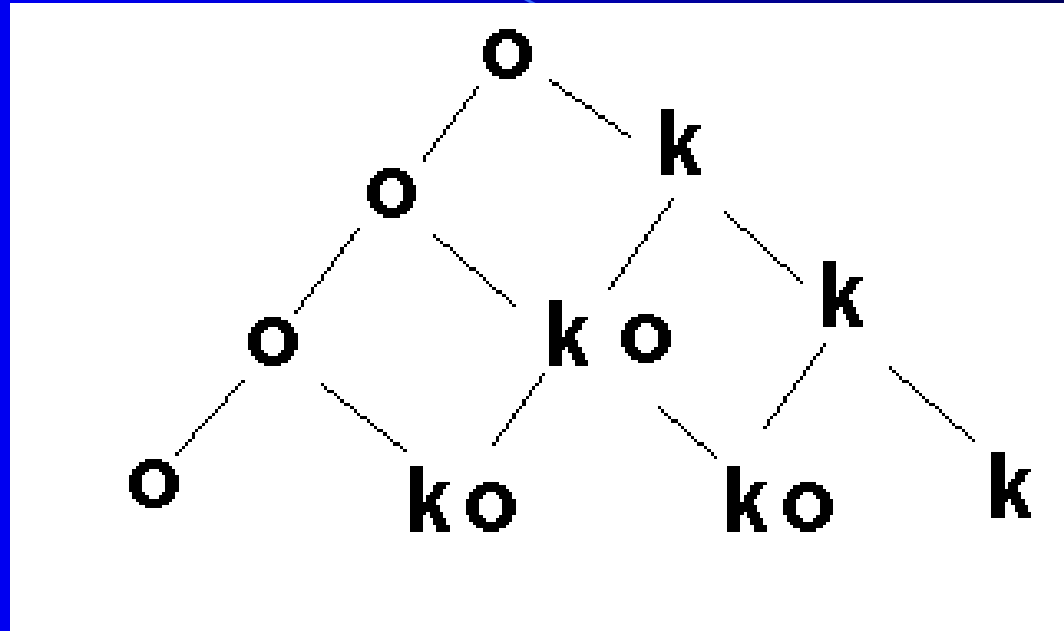
kristali

Teže topljivi

Sc, La i laki antanidi



- **FRAKCIJSKA KRISTALIZACIJA**



- **CER**

piroforne legure

70 % C

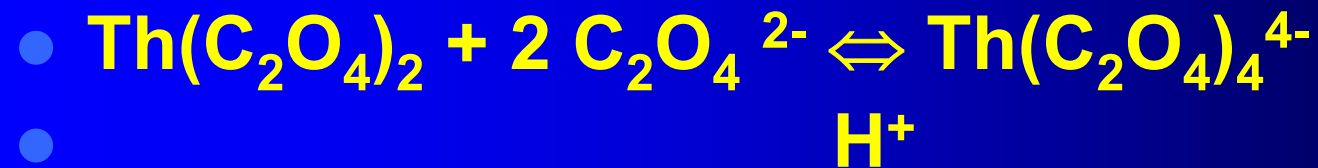
-

30 % Fe

- **Aktinidi**

- **Th, Pa, U**

- **Th Monacitni pijesak 15 % ThO₂**

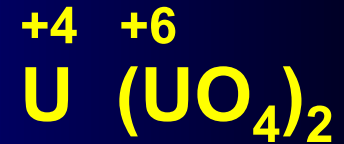


- **grijanje**



• U

URANOV SMOLINAC



0.72%



99.3%

• Dobivanje iz siromašnih ruda:



anionski izmjenjivač
eluacija s HNO_3





↓
žarenje



↓ $\text{H}_2, 900\text{ }^\circ\text{C}$

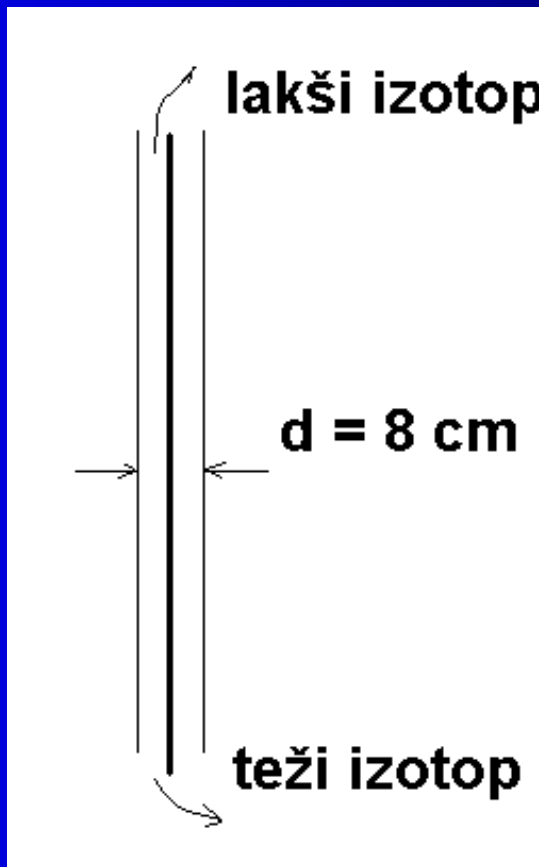


↓ HF (g)



Spojevi +4, +6

UF₆



- 4 SKUPINA

- $ns^2 (n-1) d^2$

- Ti Zr Hf Rf (rutherfordij)

- E^0 / V - 0.95 -1.53 -1.68

- MO^{2+} / M

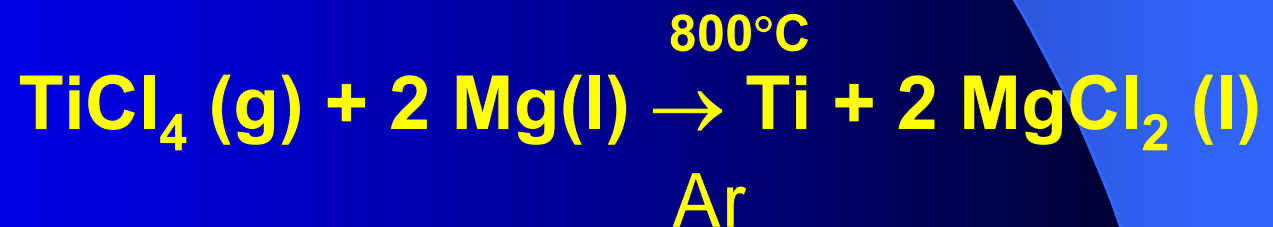
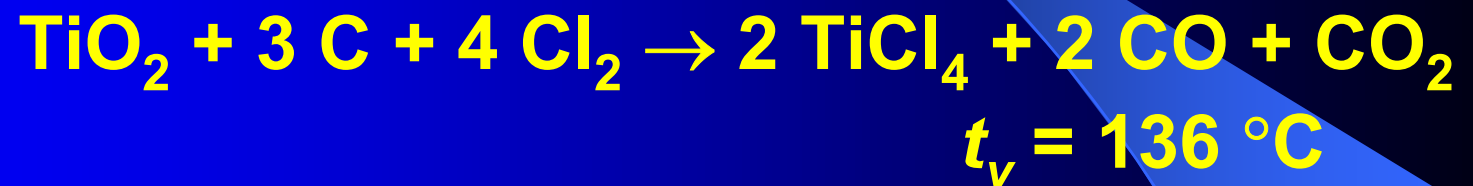
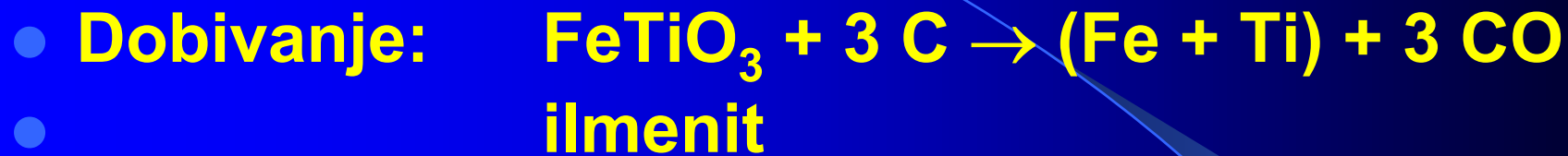
- Ar(Zr) = 0.51

- $\rho(Zr) = 0.5$

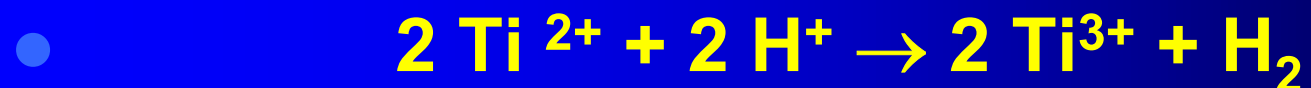
- Ar(Hf)

- $\rho (Hf)$

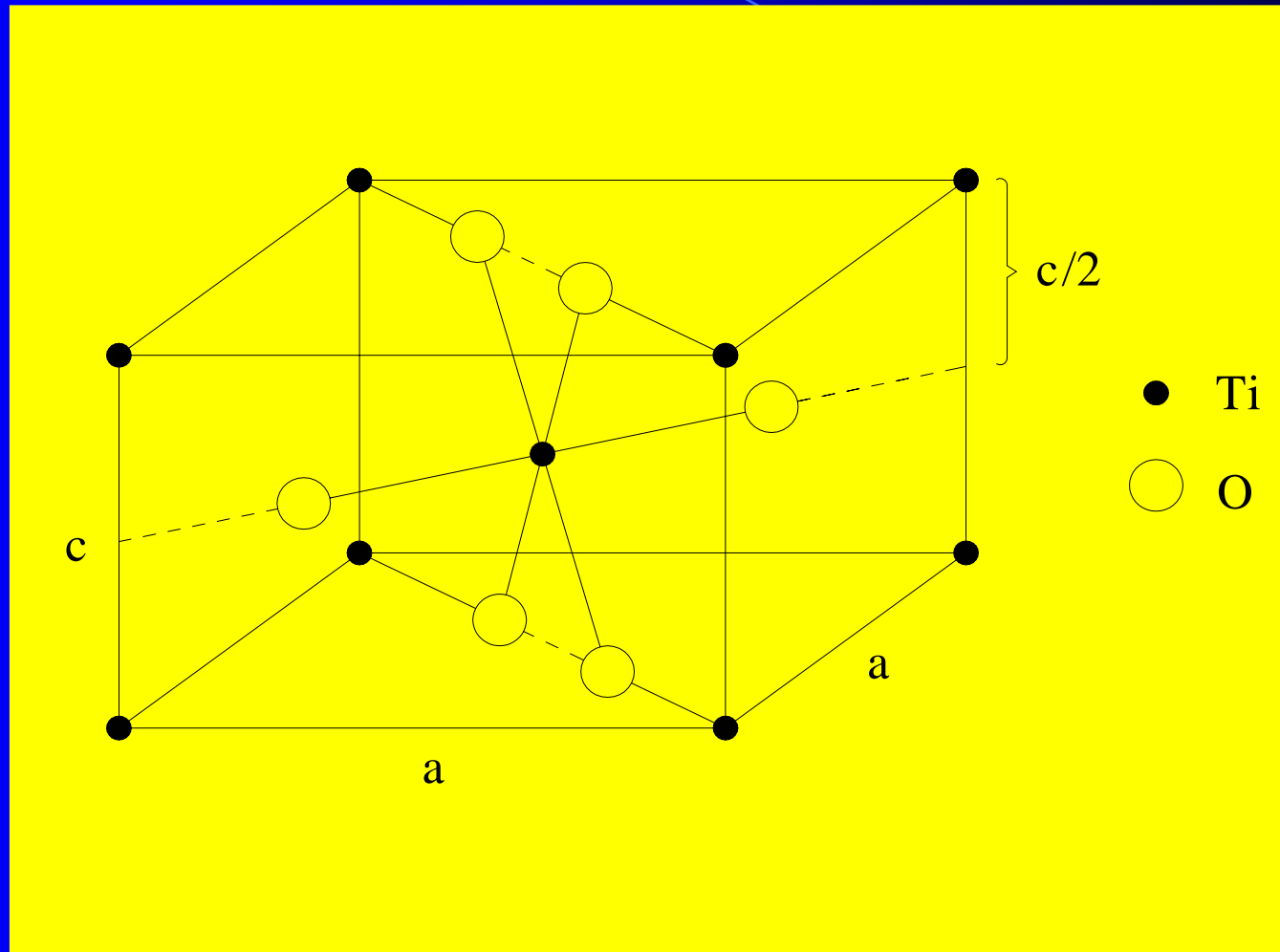
- Titan



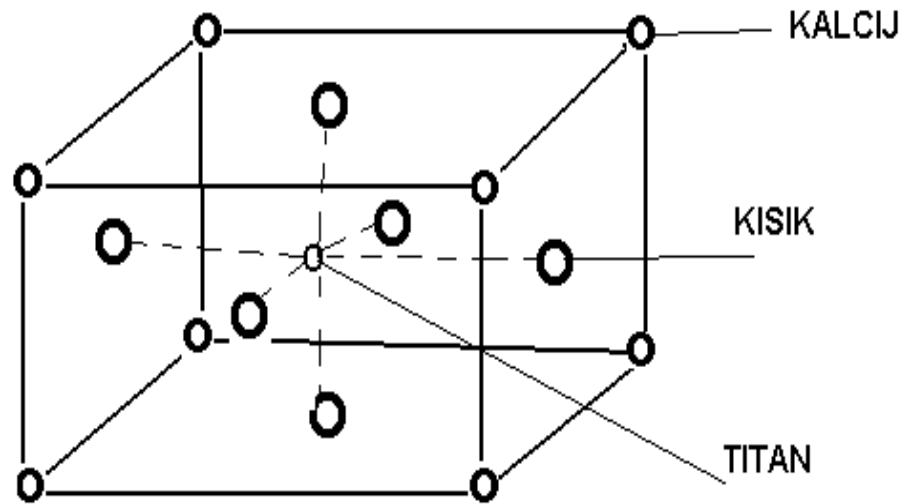
- **Spojevi: II, III, IV**



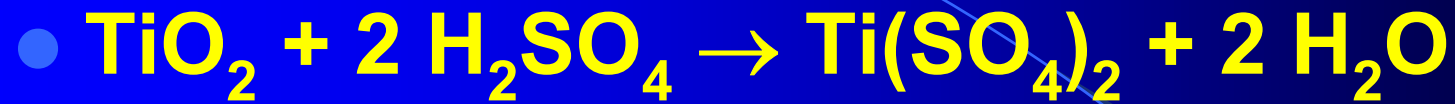
● TiO_2 , rutil



CaTiO₃, perovskit



- TiO_2 - amfoternog karaktera



H_2O



5 SKUPINA

• $E_{i, 4} \approx 48 \text{ eV}$

$ns^2(n-1)d^3$

• V

Nb

Ta

Db (dubnij)

• Oksidac. II

• Broj III

III

• IV

• V

V

V

• $E^0 (V^{2+}/V)$ -1,2

-0.7

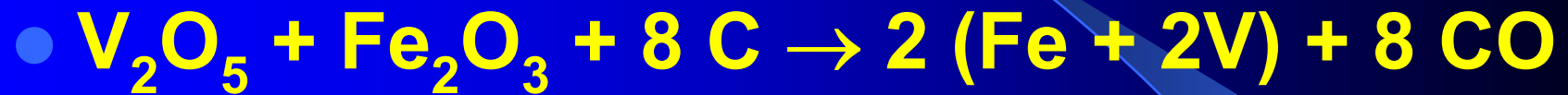
-0.8

+5

0

M_2O_5 / M

- Vanadij



- **Spojevi:**

- V_2O_5 amfoteran



- pH > 12



-

H+



-

žarenjem

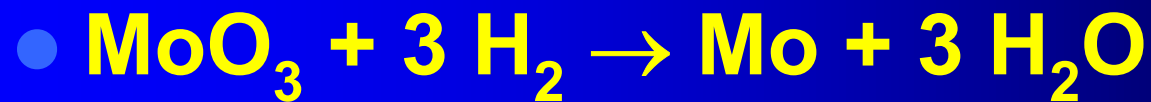
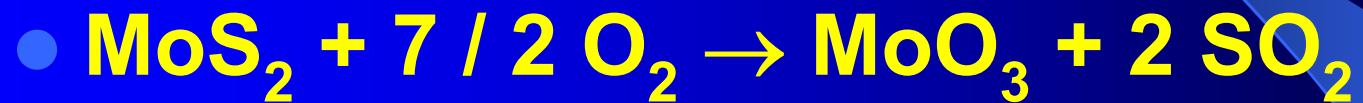


-

- Nb, Ta



- Molibden

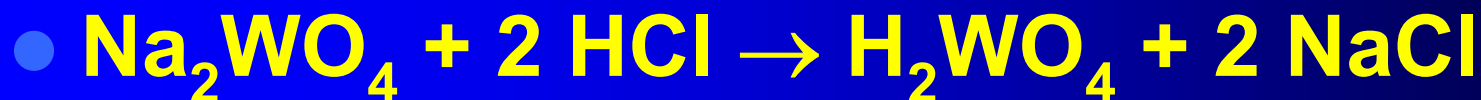
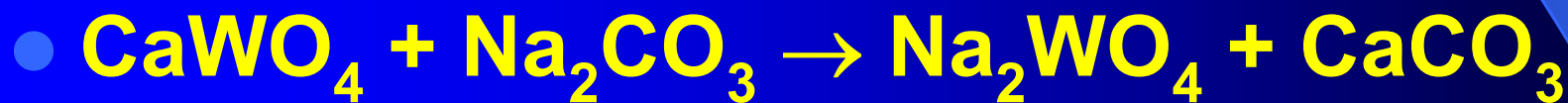
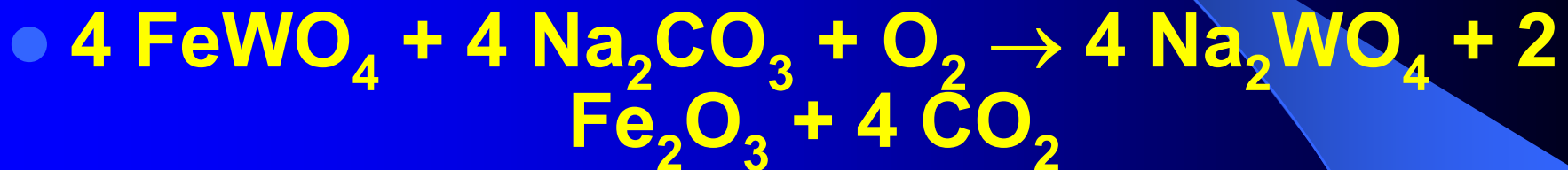
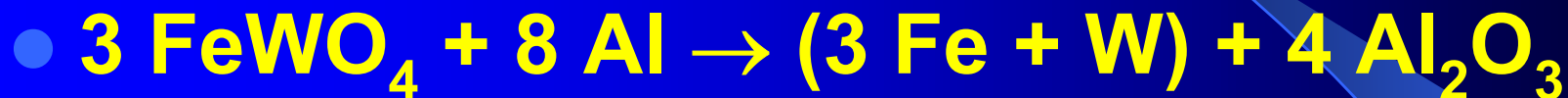


- Ferromolibden

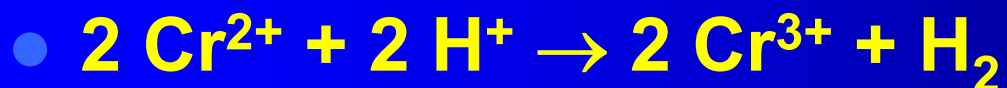
- Volfram

- FeWO_4 ferberit

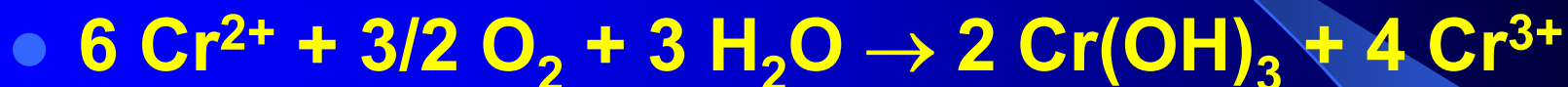
- CaWO_4 šelit



- **Spojevi:**



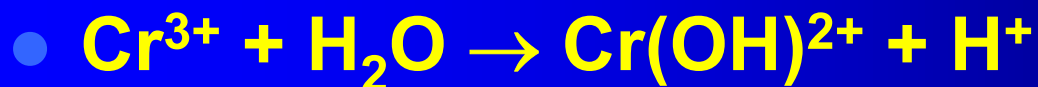
- sporo



- **III**

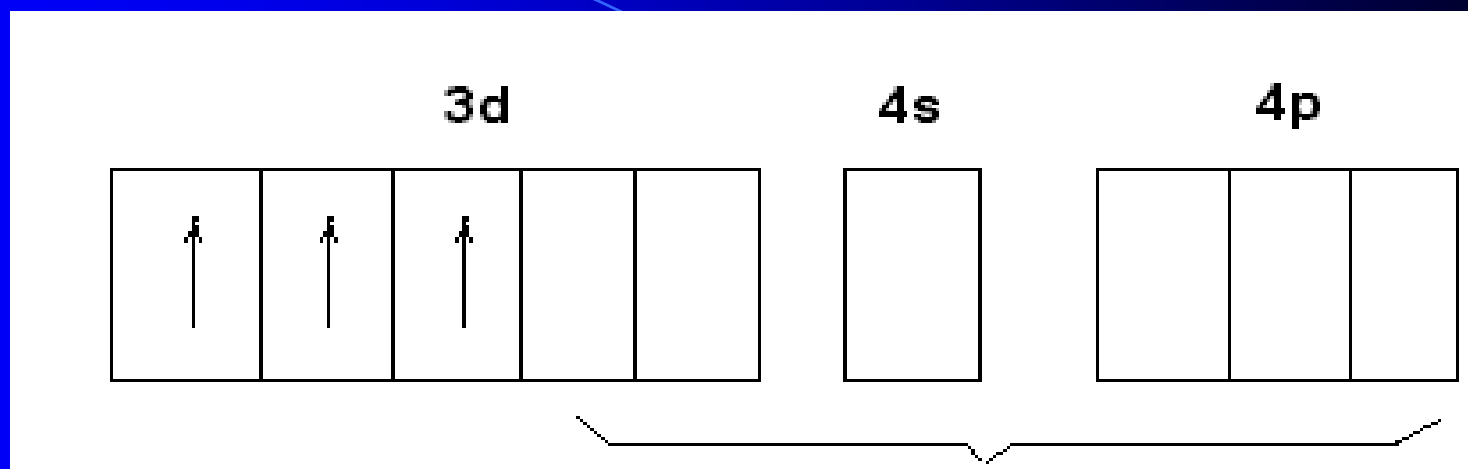
-

grij.



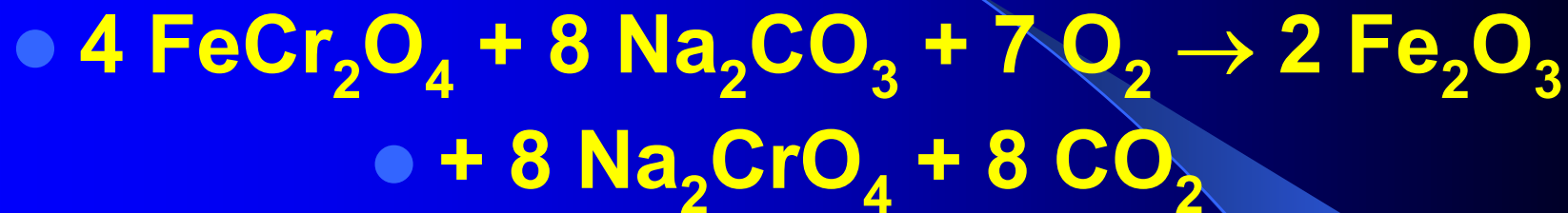
- $\text{Cr}^{3+} + 3 \text{OH}^- \rightleftharpoons \text{Cr}(\text{OH})_3 (\text{s})$
- $\text{Cr}(\text{OH})_3 + 3 \text{H}^+ \rightarrow \text{Cr}^{3+} + 3 \text{H}_2\text{O}$
- $\text{Cr}(\text{OH})_3 + \text{OH}^- \rightarrow \text{Cr}(\text{OH})_4^-$
-
- $2 \text{Cr}(\text{OH})_3 \xrightarrow{\text{grij.}} \text{Cr}_2\text{O}_3 + 3 \text{H}_2\text{O}$
- $(\text{NH}_4)_2 \text{Cr}_2\text{O}_7 \rightarrow \text{Cr}_2\text{O}_3 + \text{N}_2 + 4 \text{H}_2\text{O}$
- $\text{Cr}_2\text{O}_3 (\text{s}) + 2 \text{NaOH} (\text{l}) \rightarrow \text{Na}_2\text{Cr}_2\text{O}_4 (\text{l}) + \text{H}_2\text{O} (\text{g})$

Cr³⁺



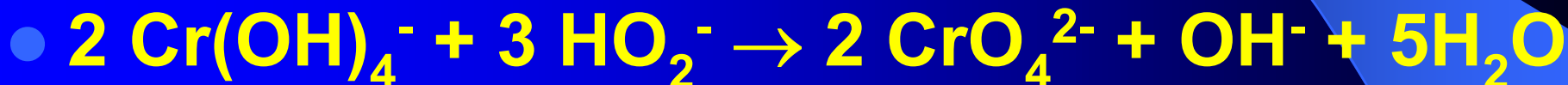
- paramagnetični d^2sp^3 – hibridi
- obojeni
- $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ ljubičast
- $[\text{Cr}(\text{NH}_3)_6]^{3+}$ najstabilniji kompleksi
- $\text{NH}_4[\text{Cr}(\text{SCN})_4(\text{NH}_3)_2] \cdot \text{H}_2\text{O}$ Reineckeova sol

● +6



● III

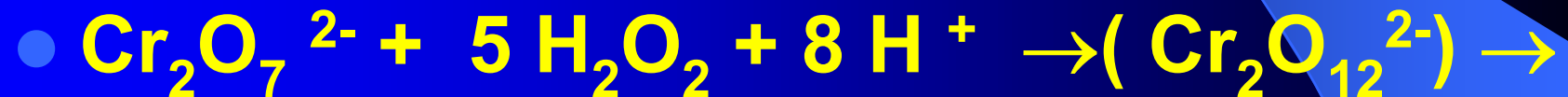
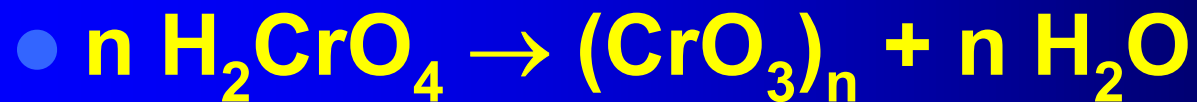
VI



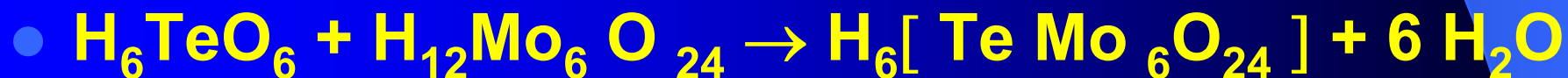
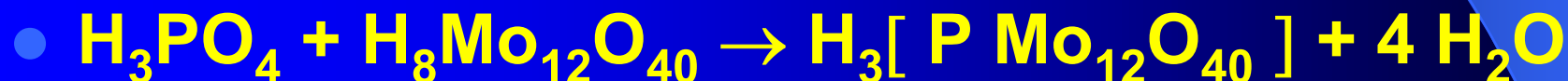
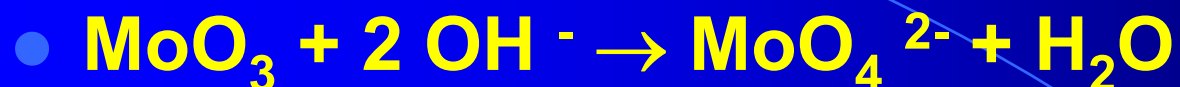


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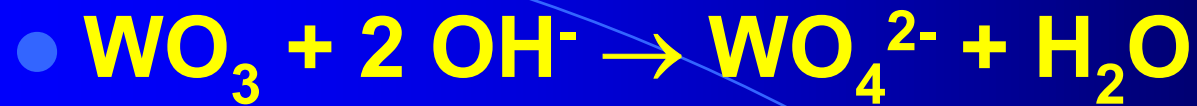
H₂SO₄



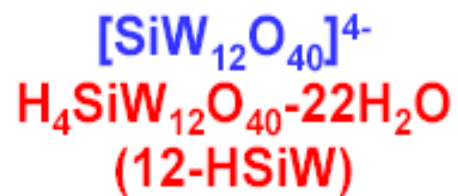
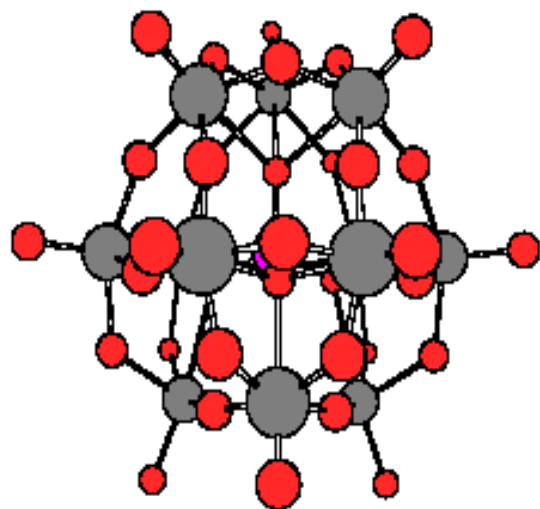
- Molibden



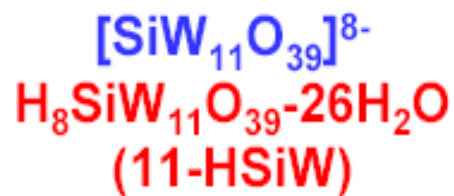
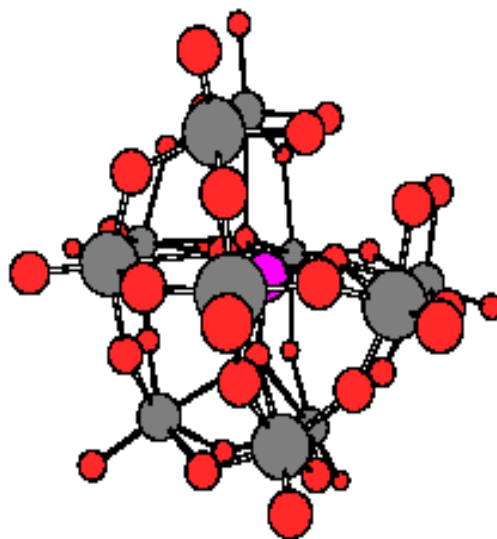
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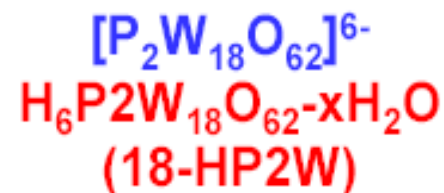
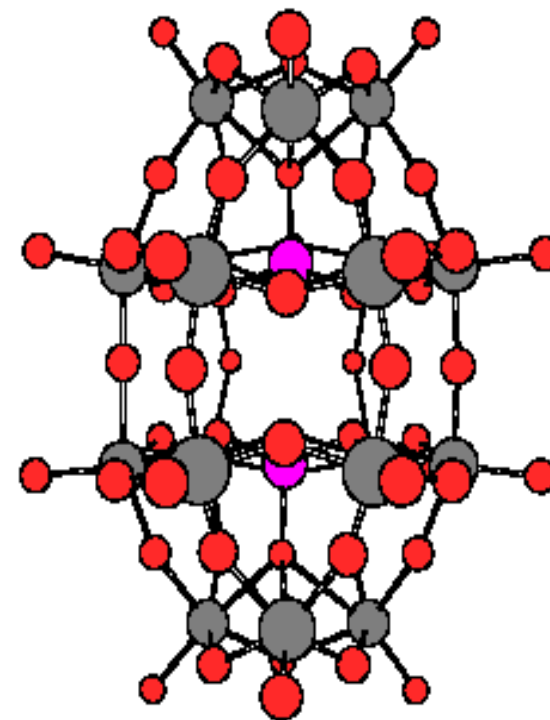
1. Keggin
(saturated)



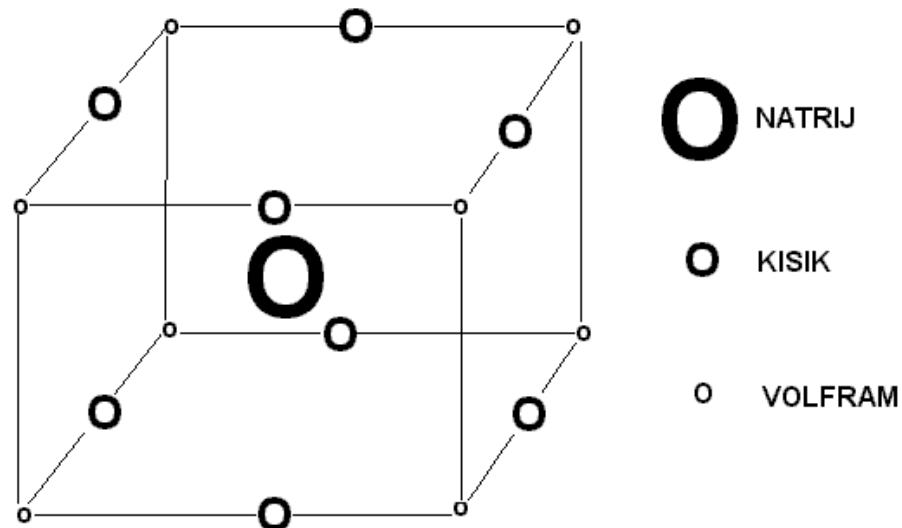
2. Lacunary
(vacant sites)



3. Dawson



- Volframove bronce: M_xWO_3
- Metalni izgled $M = \text{Li, Na, ili K}$
- Obojeni $x < 1$
- Vode struju
- Boja
- $x \approx 0.9$ zlatnožuta
- $x \approx 0.6$ crvena
- $x \approx 0.3$ ljubičasta





THE END