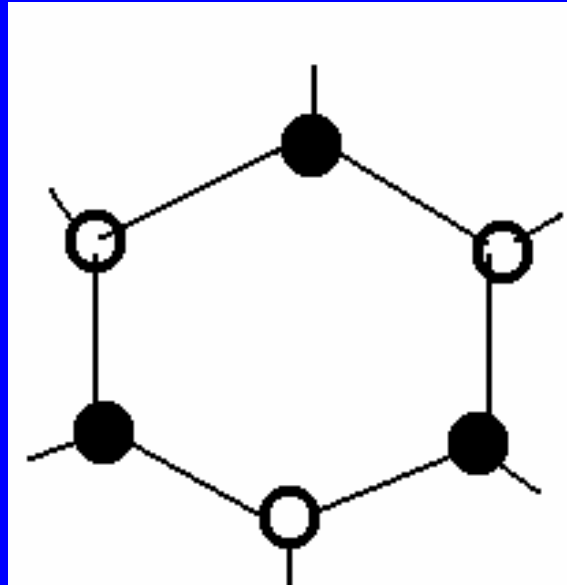


-
-
- **Asn**
- **Sbn**
- **Bin**
-

tt / °C
sublimira
631
271



DOBIVANJE: DUŠIK

- Labor. $\text{NH}_4\text{NO}_2 \rightarrow \text{N}_2 + 2\text{H}_2\text{O}$
- Industr. iz zraka
- 1.) - FRAKCIJSKA DESTILACIJA
- 2.) $4\text{N}_2 + \text{O}_2 + 2\text{C} \rightarrow 4\text{N}_2 + 2\text{CO}$
- $\underbrace{\hspace{10em}}$
- zrak
-

FOSFOR

- $\text{Ca}_3(\text{PO}_4)_2$ Fosforit
- $\text{Ca}_5(\text{PO}_4)_3\text{F}$ Fluoroapatit
- $2\text{Ca}_3(\text{PO}_4)_2 + 10 \text{C} + 6 \text{SiO}_2 \leftrightarrow 6 \text{CaSiO}_3 + 10 \text{CO} + \text{P}_4 (\text{g})$

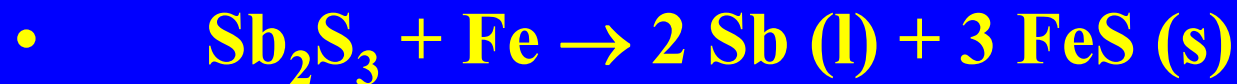
ARSEN

- **FeAsS** **Arsenopirit**
- **As₄S₄** **Realgar, As₂S₃,**
 auripigment
- **Dobivanje:** **4 FeAsS → 4 FeS + As₄**
 (g)
- **(FeAs₂ · FeS₂)**

- ANTIMON



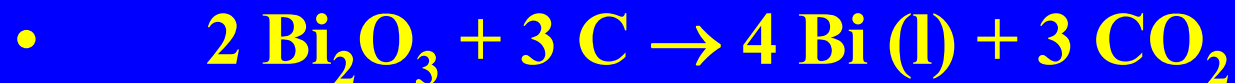
Antimonit



- BIZMUT



Bizmutov sjajnik



PREGLED REAKCIJA

- $xZ + yM \rightarrow MyZ_x$
- metal
- $2Z + 3H_2 \rightarrow 2ZH_3$
- $4Z + 3O_2 \rightarrow (Z_2O_3)_2$
- $2Z + 3X_2 \rightarrow 2ZX_3$
- halogen
-
- $2Z + 3S \rightarrow Z_2S_3$

Pad reaktivnosti
od N do Bi
za N_2
osim za N_2
osim za N_2
uz višak F_2 , Cl_2 , Br_2
 ZX_5 osim N i Bi
posebno kod Sb i Bi

SPOJEVI

- -III



-



Raste bazičnost

-

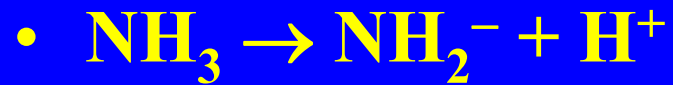
- NH₃

-



- $T_v = -33^\circ\text{C}$

- $\text{NH}_3 + \text{H}^+ \rightarrow \text{NH}_4^+$



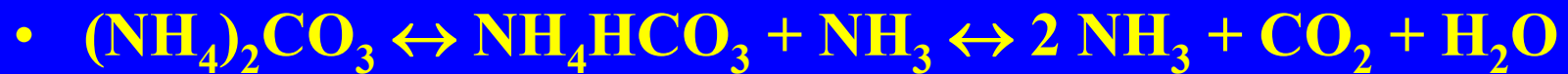
- Dobivanje:

- Laboratorijsko:



-

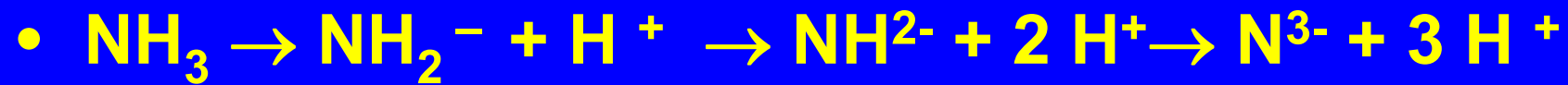
60° C



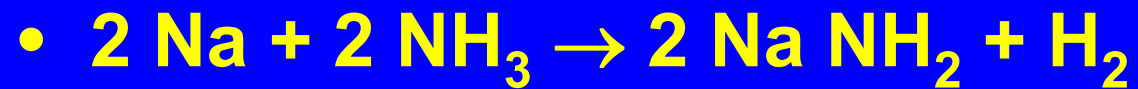
-

SVOJSTVA:

- $4 \text{ NH}_3 + 3 \text{ O}_2 \rightarrow 2 \text{ N}_2 + 6 \text{ H}_2\text{O}$
- $4 \text{ NH}_3 + 5 \text{ O}_2 \rightarrow 4 \text{ NO} + 6 \text{ H}_2\text{O} \quad \Delta_r H = -1170 \text{ J mol}^{-1}$
-
- $\text{NH}_3 (\text{ag}) + \text{H}_2\text{O} \rightarrow \text{NH}_4 (\text{ag}) + \text{OH}^- (\text{ag})$
-
- $\text{NH}_3 \cdot \text{H}_2\text{O} \quad T_t = 194 \text{ K}$



-



-



-

ionski $\text{Li}_3 \text{N}$



AlN

-

metalni

TiN

- -II $\text{H}_2\text{N}-\text{NH}_2$ Hidrazin

-



-



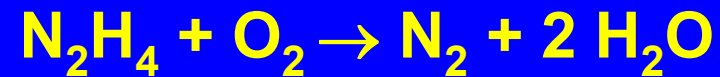
- *Raketno gorivo:*

-

Cu^{2+}



-

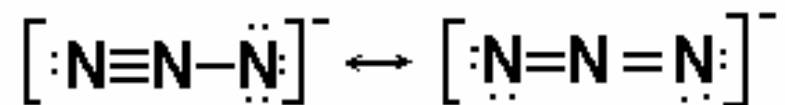


-

O_2 Otopljen u vodi



AZIDI



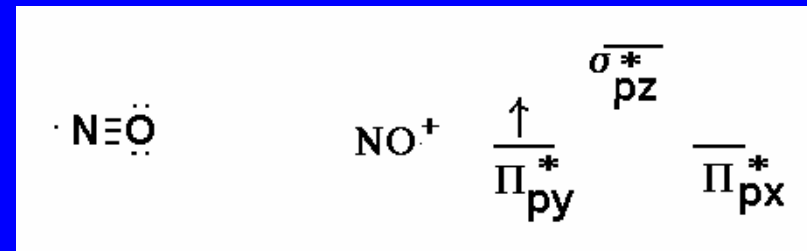
- $\text{N}_2\text{H}_4 + \text{NaNO}_2 \rightarrow \text{NaN}_3 + 2 \text{H}_2\text{O}$
- $\text{N}_2\text{O} + 2 \text{Na}_2\text{O} + \text{NH}_3 \xrightarrow{<190^\circ \text{C}} \text{NaN}_3 + 3 \text{NaOH}$
- $2 \text{NH}_3 \rightarrow 3 \text{N}_2 + \text{H}_2 \quad \Delta_r H < 0$
- $\text{Pb}(\text{N}_3)_2$

I N₂O

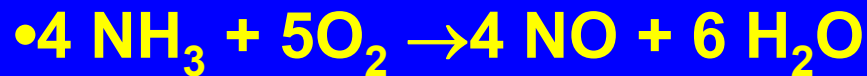
- Dob:
-
-



• II NO



$$\Delta_r H = 180 \text{ kJ/mol}$$



-



$$\Delta_r H = -1167 \text{ kJ/mol}$$

- III

-

- N_2O_3 , HNO_2 , soli

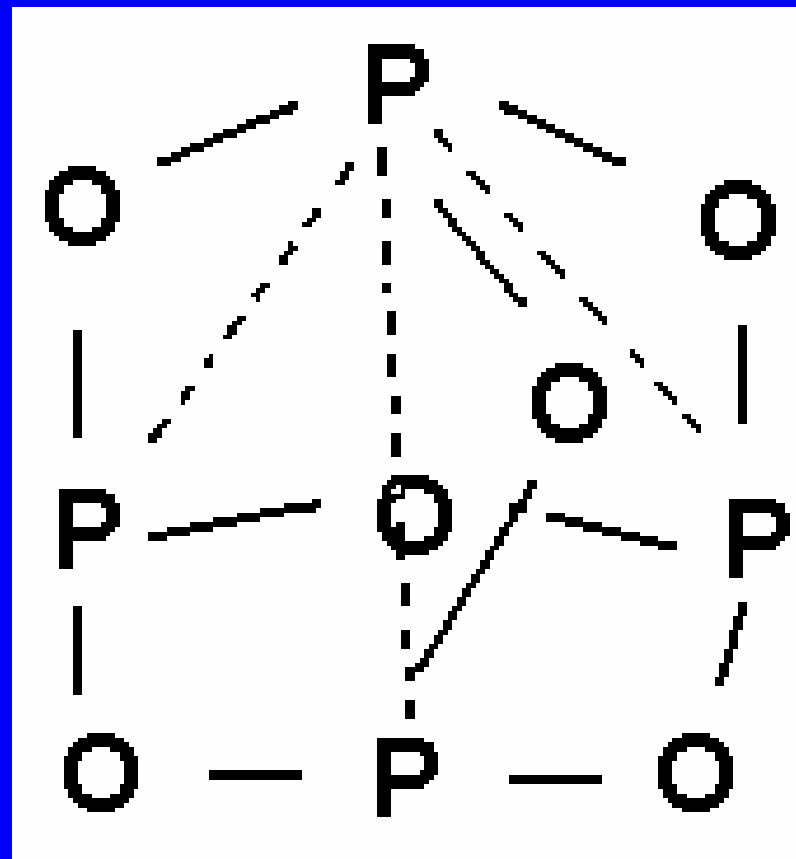
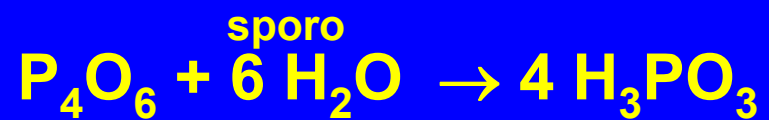
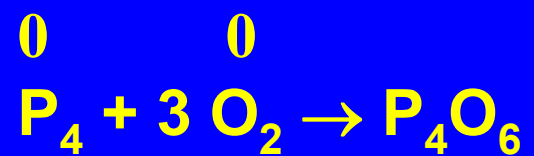
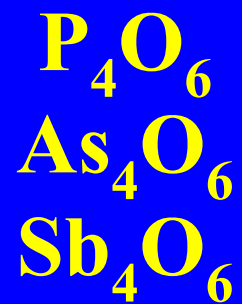
- P_4O_6 , H_2PHO_3 soli

- As_4O_6 H_3AsO_3 soli

- Sb_4O_6 } *netopljivi u vodi*

- Bi_2O_3 } *netopljivi u vodi*

- $3 \text{NO}_2 + \text{H}_2\text{O} \rightarrow 2 \text{HNO}_3 + \text{NO}$ *dob. ušične kis.*
- $2 \text{NO} + \text{O}_2 \rightarrow 2 \text{NO}_2$
- $2 \text{HNO}_3 \rightarrow \text{H}_2\text{O} + 2 \text{NO}_2 + \frac{1}{2} \text{O}_2$
- (čista)
- $\text{HNO}_3 + \text{H}^+ + \text{e}^- \rightarrow \text{NO}_2 + \text{H}_2\text{O}$ $E^0 = + 0.79 \text{ V}$
- (konc.)



16. SKUPINA ns²np⁴

	O	S	Se	Te	Po
\underline{Ei} eV	13,6 O ₂ 12,1	10,4	9,8	9	8,4
$-\underline{Ea}$ eV	7,3	3,4	4,2		
X	3,5	2,5	2,4	2,1	
$\underline{E^o}$ V	1,23	0,14	-0,4	-0,7	
	$X + 2 H^+ + 2e^- \leftrightarrow H_2X$				

$$\begin{array}{ccc}
 \text{O}_2 & & \text{O}_3 \\
 |01 & = & |01 \\
 & & |01 = \overset{+}{\underset{-}{0}} \rightarrow |0\bar{1}| \\
 & & \underbrace{\hspace{1.5cm}}_{127^\circ}
 \end{array}$$

ELEMENTARNE TVARI

O_2

S_8 (romb.)

Se_n (metal)

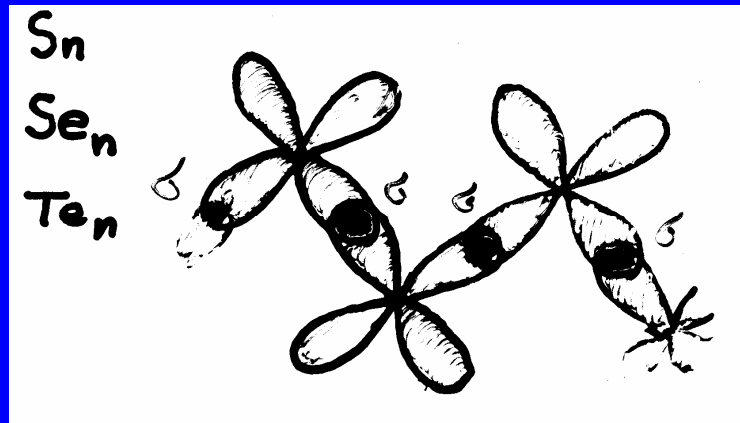
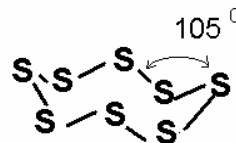
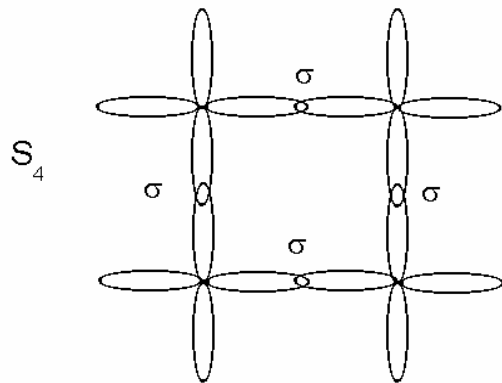
Te_n

$\uparrow\downarrow 96^\circ C$

O_3

S_8 (monokl.)

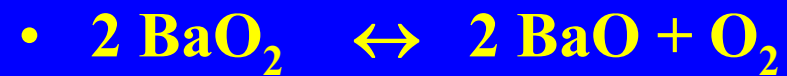
Se_8 (sivi)



DOBIVANJE:

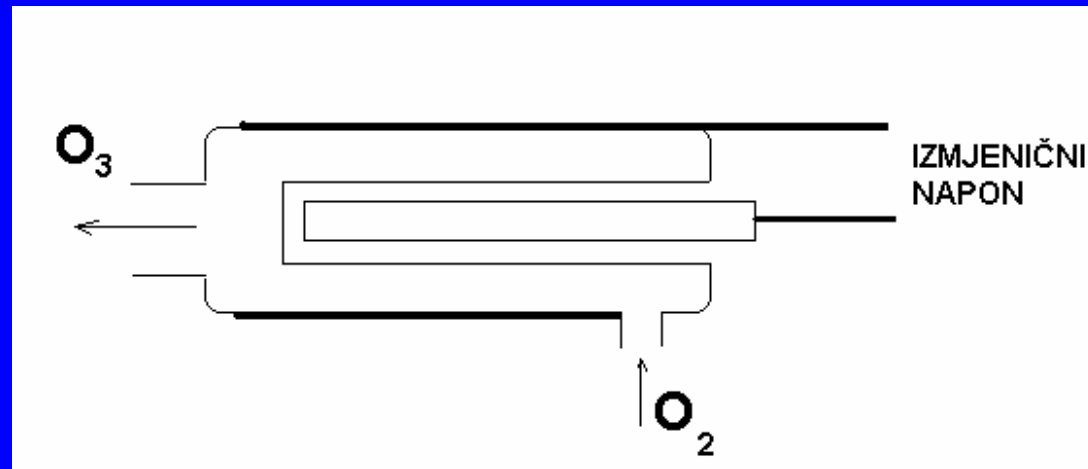
- **KISIK-iz zraka**

- 750°C



- 500°C

- **OZON**



PREGLED REAKCIJA HALKOGENA

- $xX + yM \rightarrow M_yX_x$
- $X + H_2 \rightarrow H_2X$
- $X + O_2 \rightarrow XO_2$
- $3X + 4HNO_3 \rightarrow 3XO_2 + 2H_2O + 4NO$
- $X + 3F_2 \rightarrow XF_6$ S; Se, Te
- $X + 2Cl_2 \rightarrow XCl_4$ S; Se, Te
-

SPOJEVI

•		H₂O	H₂S	H₂Se	H₂Te
•				←	
•				RASTE STABILNOST	
•	t_f				
•	°C	0	-85	-60	-51
•	\underline{K}_1				
•	mol L ⁻¹	10 ⁻¹⁶	10 ⁻⁷	2 · 10 ⁻⁴	2 · 10 ⁻³
•		H₂X ↔ H⁺ + HX⁻			
•	\underline{K}_2				
•	mol L ⁻¹	10 ⁻³⁶	10 ⁻¹⁵	10 ⁻¹⁰	10 ⁻⁵
•		HX⁻ ↔ H⁺ + X²⁻			
•	O²⁻ + H₂O ↔ 2 OH⁻			K_H > 10²² molL⁻¹	

OSTALI SPOJEVI:

OKSIDI:	-KISELI	CO₂, SO₃, SiO₂
•	-BAZNI	Na₂O, CaO
•	-AMFOTERNI	Sb₄O₆, ZnO
•	-NEUTRALNI	N₂O, NO, CO

- OVISNOST KISELOSTI O OKSID. STUPNJU:

-



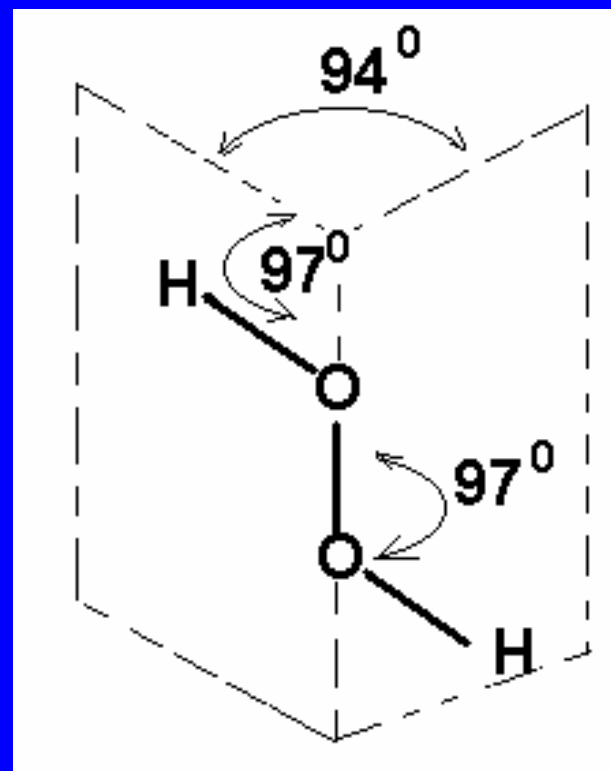
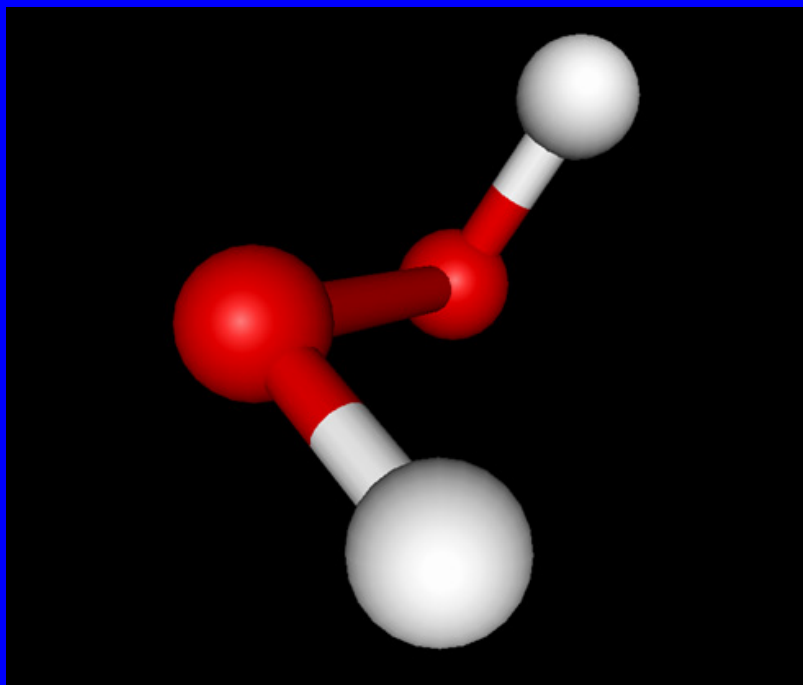
-



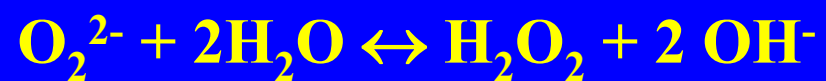
-

-I

H_2O_2



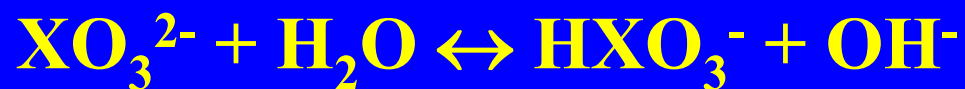
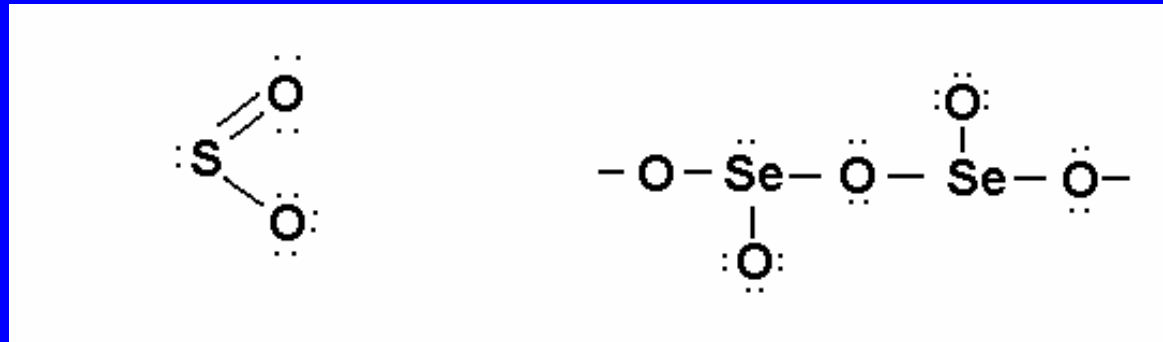
$$K_1 = 10^{-12} \text{ mol dm}^{-3}$$

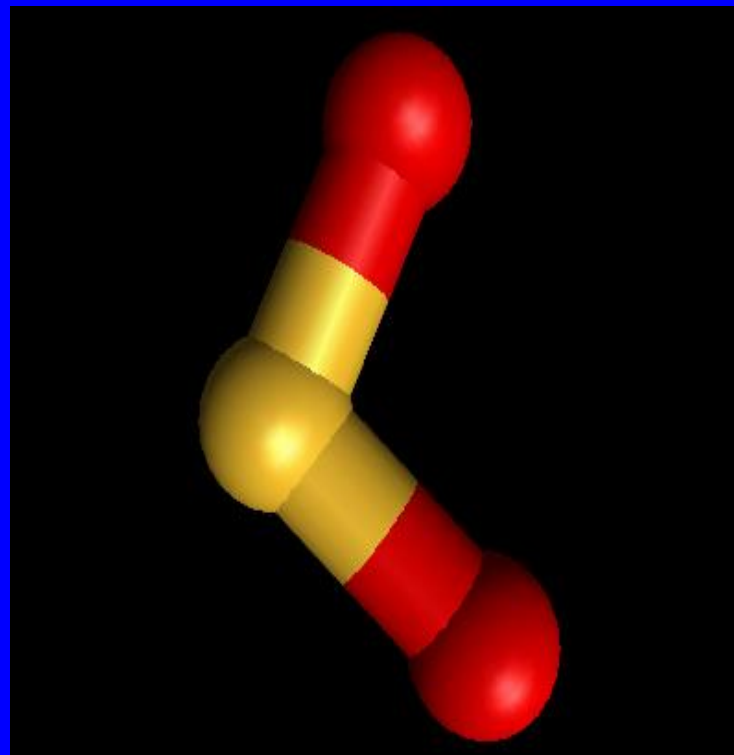
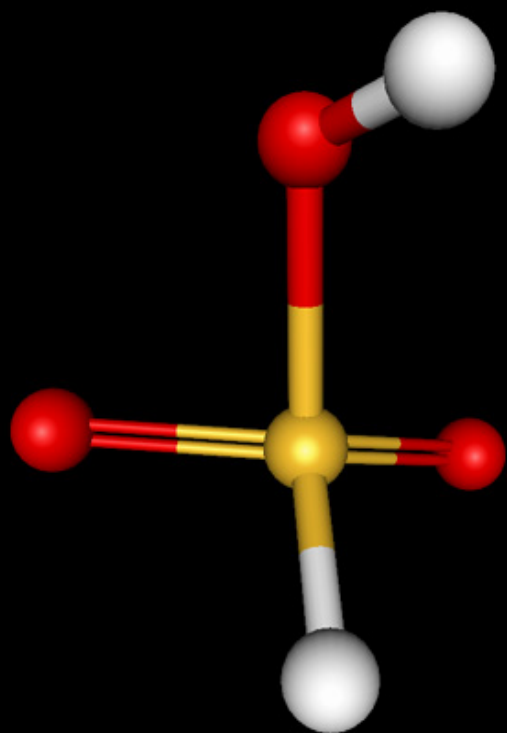


SVOJSTVA

- $\text{H}_2\text{O}_2 + 2\text{H}^+ + 2\text{e}^- \leftrightarrow 2 \text{H}_2\text{O}$ $E^\circ = 1,77 \text{ V}$
- $\overset{-1}{\text{HO}_2^-} + \text{H}_2\text{O} + 2\text{e}^- \leftrightarrow 3 \text{OH}^-$ $E^\circ = 0,87 \text{ V}$
- $\overset{0}{\text{O}_2} + 2\text{H}^+ + 2\text{e}^- \leftrightarrow \overset{-1}{\text{H}_2\text{O}_2}$ $E^\circ = 0,7 \text{ V}$
- $\overset{0}{\text{O}_2} + 2 \text{OH}^- + 2\text{e}^- \leftrightarrow 2 \overset{-1}{\text{HO}_2^-}$ $E^\circ = -0,08 \text{ V}$
- $\overset{-1}{\text{H}_2\text{O}_2} \rightarrow \overset{-II}{\text{H}_2\text{O}} + \overset{0}{1/2 \text{O}_2}$

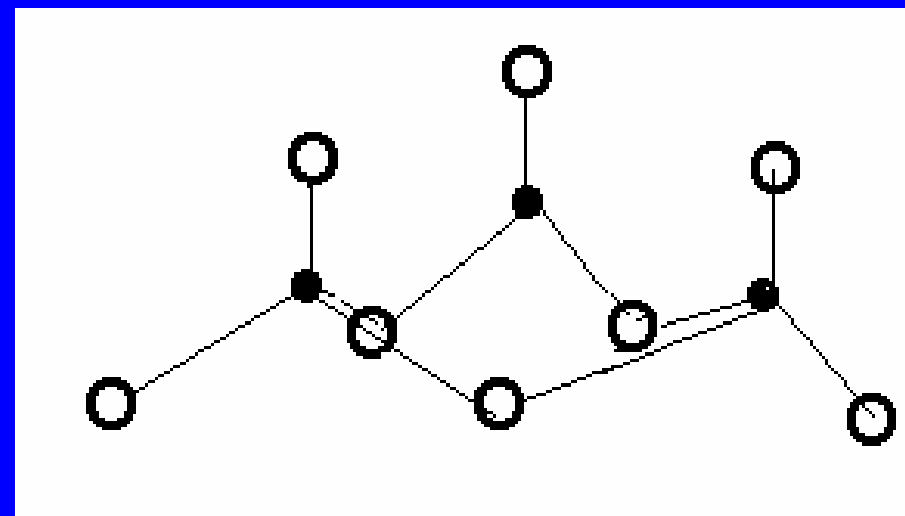
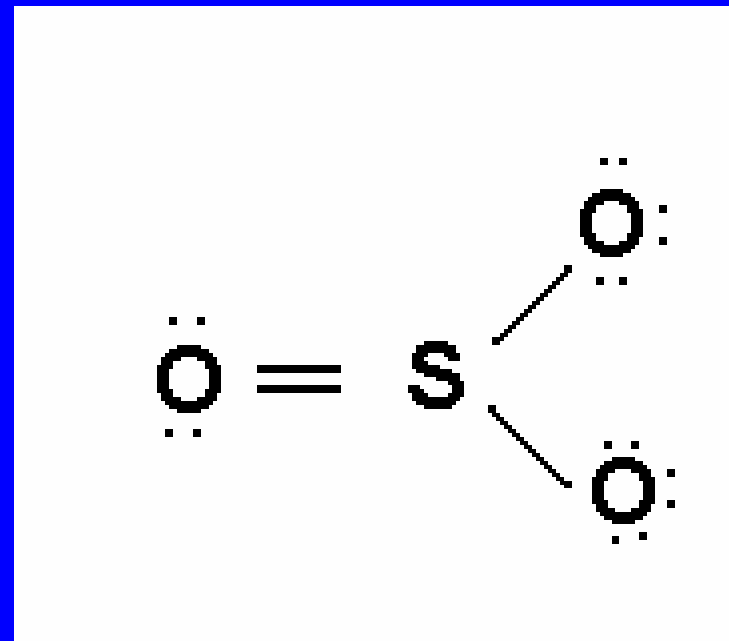
- SO_2 SeO_2 TeO_2
- ←
- **AMFOTERAN**
- **KISELOST**





• Sumporasta kiselina

VI



- $\text{SO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$, $\Delta H_r = -90 \text{ kJ/mol}$
- $\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_7$

