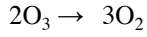
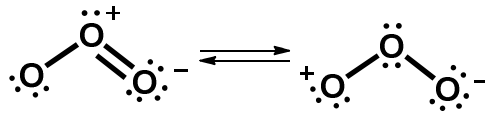
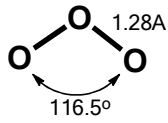
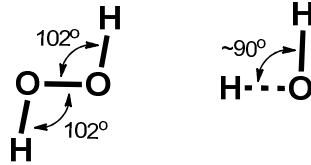


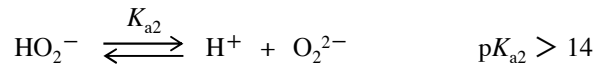
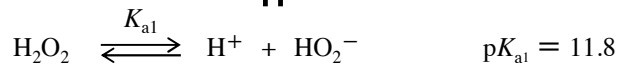
オゾン



過酸化水素

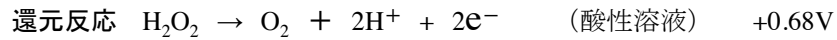
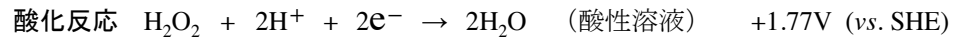


酸解離定数



ブレンステッド酸としての能力は弱い

酸化還元挙動



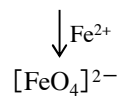
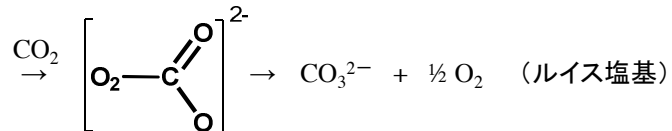
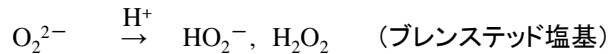
酸化・還元の一両反応を行うが、酸化剤としての能力が強い

過酸化物

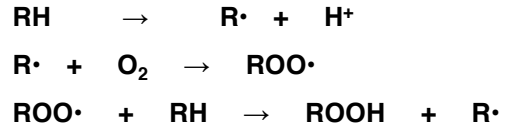
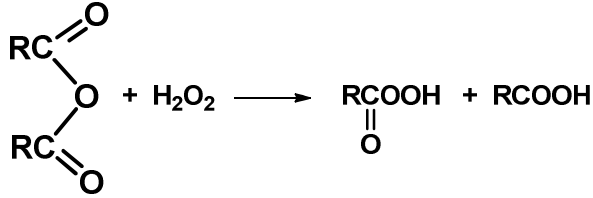
金属過酸化物(イオン性) M^+O_2 , M^{2+}O_2 , M^+OOH

有機過酸化物(共有結合性) R-OOH , RC-OOH , ROOR'

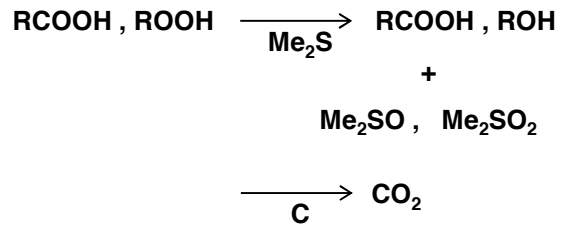
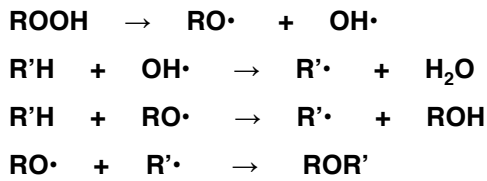
・金属過酸化物 Na^+ , K^+ , Mg^{2+} , Ca^{2+} などで安定なものが得られる



・有機過酸化物
生成

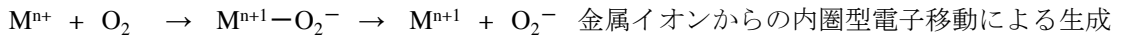
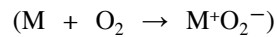
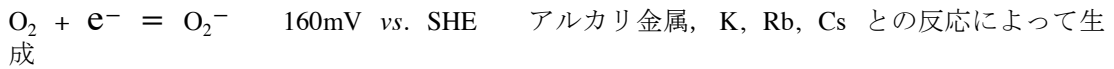


反応

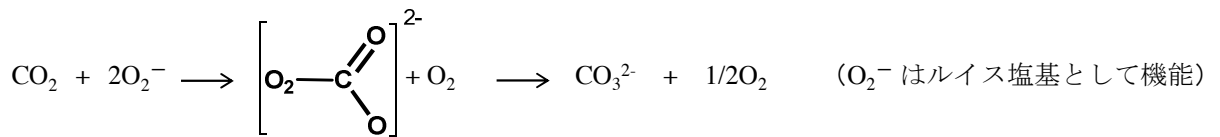
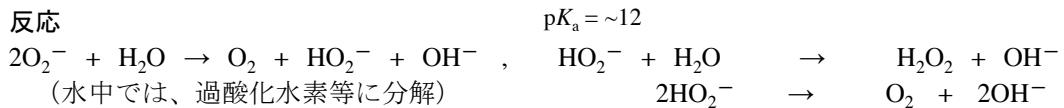


超酸化物(活性酸素)

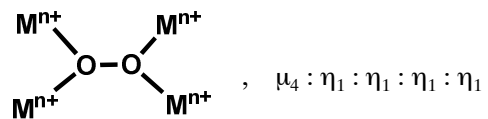
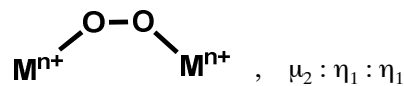
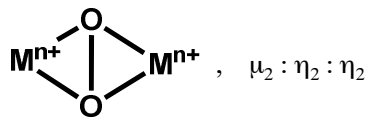
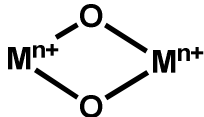
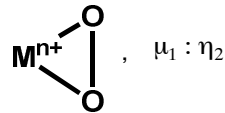
生成



反応



☆ 金属イオンへの酸素の配位様式



μ_x : 酸素分子が架橋する金属イオンの数
 η_y : 金属イオンの配位数

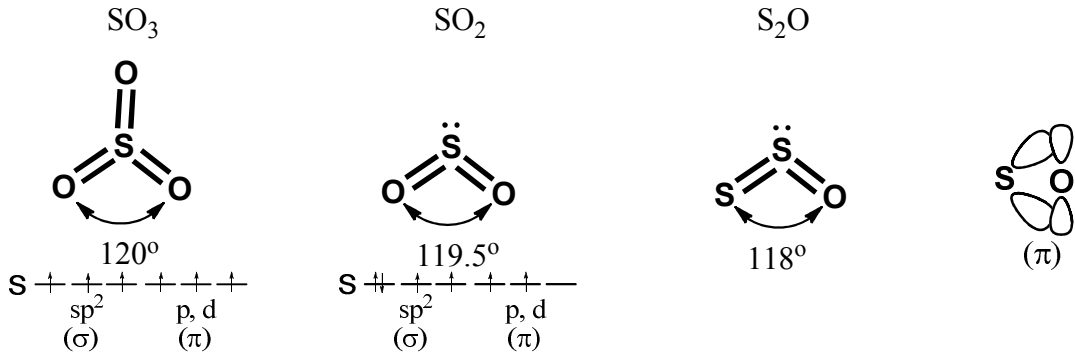
2. イオウ

+6	+5	+4	+3	+2	0	-1	-2
SO ₄ ²⁻	S ₂ O ₆ ²⁻	SO ₃ ²⁻	S ₂ O ₄ ²⁻	S ₂ O ₃ ²⁻	S _n	H ₂ S ₂	H ₂ S
SO ₃		SO ₂		S ₄ O ₆ ²⁻ (+2.5)			
						cf O : -1, -2のみ	

特徴： ・ d軌道の結合形成への関与

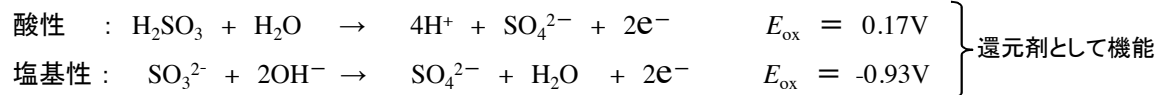
- ・ dπ - pπ 結合形成 → 多重結合性 (pπ - pπ 型結合は稀)
- ・ カトネーション . . . -S-S-S- . . . S_n : 6 ≤ n ≤ 12 環状、8 が一般的
- S₂ : O₂ と同構造、常磁性
- S₆ : いす型コンフォメーション

☆酸化物 SO₃, SO₂, S₂O

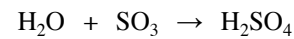
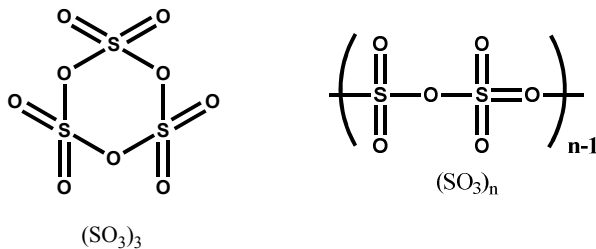


・ SO₂ 極性、常温で液体、単量体として存在

$$pK_a = 1.9$$



・ SO₃ 常温で固体、多量体として存在



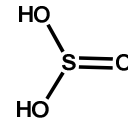
・ S₂O 常温でガス、不安定

☆ オキソ酸

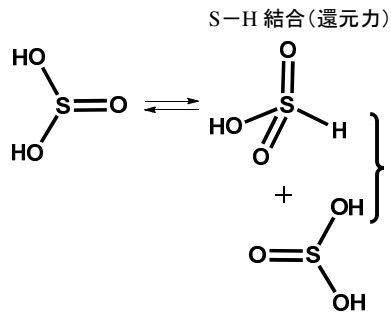
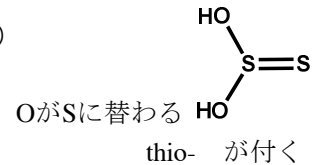
Sの酸化数	I~IV	V, VI (例外あり)
酸	-ous acid (亜酸)	-ic acid (酸)
塩	-ite (亜酸塩)	-ate (酸塩)

group1 スルホキシル酸
 H_2SO_2 (II) $HO-S-OH$
 Sulfoxylic acid

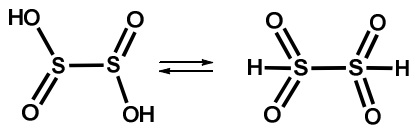
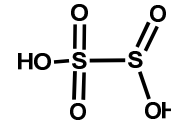
group2 亜硫酸系 (Sulfurous series)
 • H_2SO_3 (IV)
 Sulfurous acid
 亜硫酸



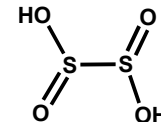
• $H_2S_2O_2$ (II, O)
 Thiosulfurous acid
 チオ亜硫酸



• $H_2S_2O_5$ (V, III)
 Disulfurous acid
 二亜硫酸

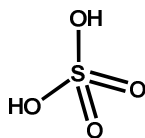


• $H_2S_2O_4$ (III)
 Dithionous acid
 亜ジチオン酸



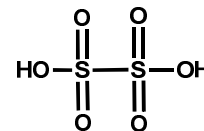
group3 硫酸系 (Sulfuric acid)

• H_2SO_4 (IV)
 Sulfuric acid
 硫酸

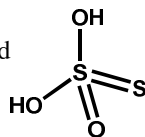


group4 チオン酸系 (Thionic acid)

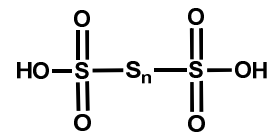
• $H_2S_2O_6$ (V)
 Thionic acid
 ジチオン酸



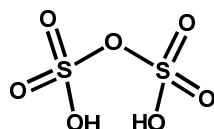
• $H_2S_2O_3$ (IV, O)
 Thiosulfuric acid
 チオ硫酸



• $H_2S_nO_6$ (V)
 Polythionic acid

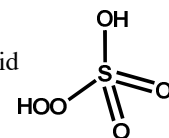


• $H_2S_2O_7$ (VI)
 Disulfuric acid
 二硫酸 (発煙硫酸)

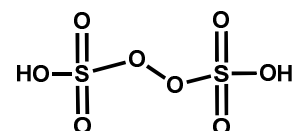


group5 ペルオキソ硫酸 (Peroxisulfuric acid)

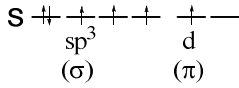
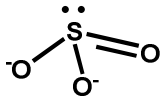
• H_2SO_5 (VI)
 peroxomonosulfuric acid



• $H_2S_2O_8$ (VI)
 peroxodisulfuric acid



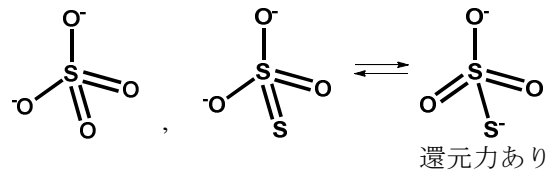
・亜硫酸



イオウオキシ酸合成の鍵となる化合物

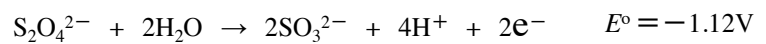
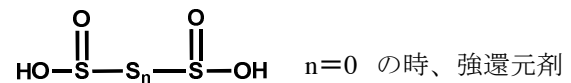
- $\text{SO}_3^{2-} + 2\text{H}^+ \rightarrow \text{SO}_2 + \text{H}_2\text{O}$
(H_2SO_3 は、不安定)
- $\text{SO}_3^{2-} \xrightarrow{\text{HClO}} \text{SO}_4^{2-} + \text{Cl}^- + \text{OH}^-$
- $\text{SO}_3^{2-} \xrightarrow[\text{S}]{\Delta} \text{S}_2\text{O}_3^{2-}$
- $2\text{HSO}_3^- \xrightarrow{\Delta} \text{S}_2\text{O}_5^{2-} + \text{H}_2\text{O}$
- $\text{HSO}_3^- + \text{SO}_2 \rightarrow \text{HS}_2\text{O}_5^-$
- $\xrightarrow{\text{H}^+ + \text{Zn}} \text{S}_2\text{O}_4^{2-} + \text{H}_2\text{O} + \text{Zn}^{2+}$

・硫酸、チオ硫酸

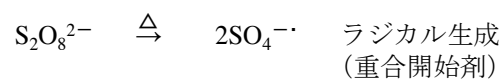


- $2\text{S}_2\text{O}_3^{2-} + \text{I}_2 \xrightarrow[\text{カルキ抜き}]{\text{HClO}} \text{S}_4\text{O}_6^{2-}$
- $\text{S}_2\text{O}_3^{2-} + \text{M}^{n+} \rightarrow [\text{M}(\text{S}_2\text{O}_3)_m]^{(n-2m)+}$
 ソフト (S⁻), ハード (O⁻) 塩基を内包するため
 様々な金属イオンと錯形成が可能

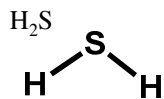
・亜ジチオン酸骨格



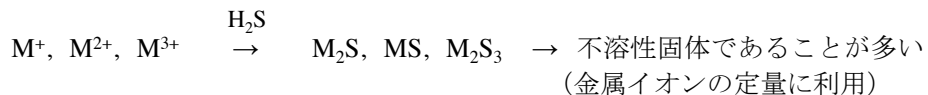
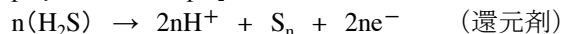
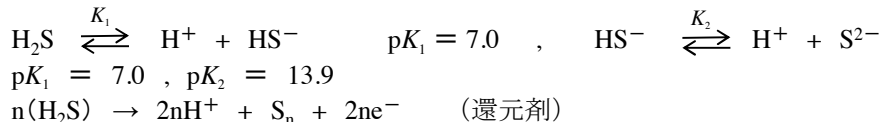
・ペルオキシ硫酸



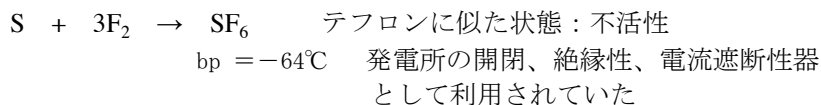
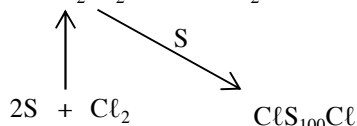
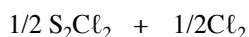
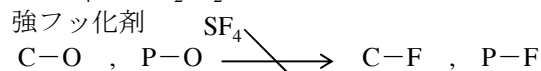
☆水素化物 H_2S_n $\text{HS-S}_{n-2}\text{-SH}$ $n \geq 2$,



双極子モーメント 1.02D B.P. = -60.7°C
cf H_2O : 1.94D

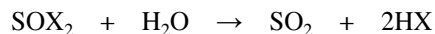
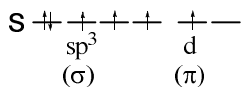
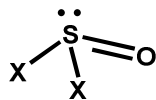


☆ハロゲン化物 $\text{SF}_4, \text{SF}_6, \text{SCl}_2, \text{S}_2\text{Cl}_2$

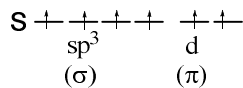
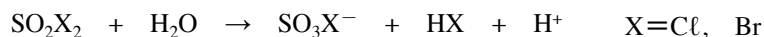
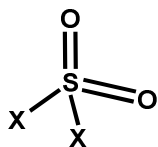


☆ハロゲン化酸化物 SOX_2 , SO_2X_2 , SO_3X^- X=F, Cl, Br
ハロゲン化 ハロゲン化 ハロゲン化
スルフィニル スルホニル スルホン酸
(チオニル)

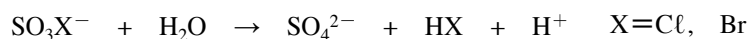
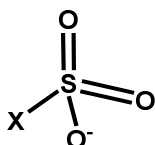
SOX_2



SO_2X_2



SO_3X^-



X = F は、以上の反応に対して不活性