

Descriptive Mineralogy
Non-Silicates:

Sulfates

Sulfates

- *Gypsum* $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
- *Anhydrite* CaSO_4
- *Celestine* SrSO_4
- *Barite* BaSO_4
- *Anglesite* PbSO_4
- *Alunite* $\text{KAl}_3(\text{OH})_6(\text{SO}_4)_2$



Gypsum

- *$CaSO_4 \cdot 2H_2O$*
- *Hardness 2*
- *Evaporite Mineral*
- *Contains molecular water*

Anhydrite



CaSO₄

Hardness 3-3.5

Evaporite

Mineral

*Contains no
molecular
water*

Celestine $SrSO_4$



- Occurrence: Low T Hydrothermal
- Use: Principal source of Sr

Barite

BaSO₄



- Occurrence: Low T Hydrothermal
- Uses: Source of Ba, Drilling Mud

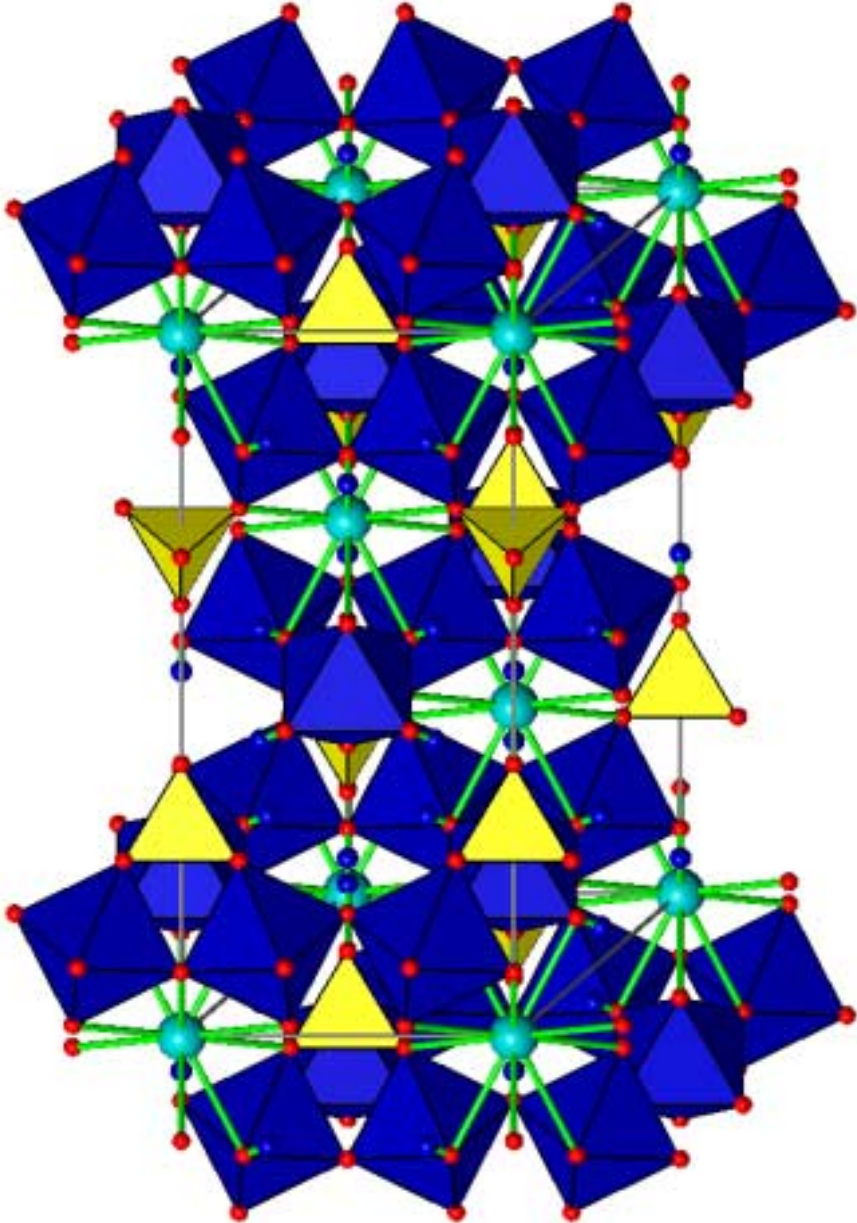
Anglesite $PbSO_4$



Occurrence: Oxidized
Hydrothermal

Use: Minor Pb
Ore

Alunite $KAl_3(SO_4)_2(OH)_6$



- Occurrence: Hydrothermal
Acid sulfate alteration
(After feldspar)
- Use: Associated with
gold

Phosphates, Tungstates, Vanadates

- *Phosphates are based on $P^{5+}O_4$*
- *Tungstates and Vanadates are based on $W^{6+}O_4$ and $V^{5+}O_4$ tetrahedra.*

Apatite $Ca_5(PO_4)_3(OH), F, Cl$



Occurrence: Accessory in Igneous and Metamorphic Rocks

Uses: Teeth, Bones

Scheelite $CaWO_4$



- Occurrence: High T Hydrothermal
- Uses: Major Ore of W

Wolframite $(Fe, Mn)WO_4$

Ferberite $FeWO_4$

Huebnerite $MnWO_4$



- Occurrence: High T Hydrothermal
- Uses: Major Ore of W