

Greenwood & Earnshaw

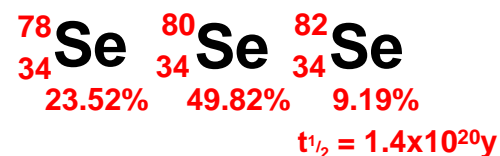
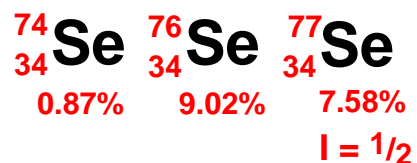
2nd Edition

Chapter 16

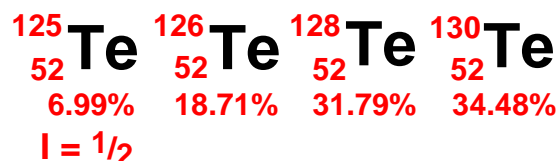
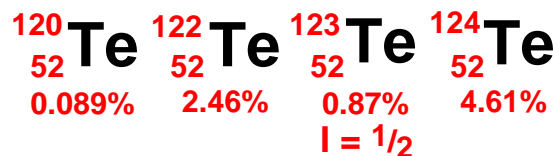
Selenium, Tellurium & Polonium

Selenium, Tellurium, Polonium

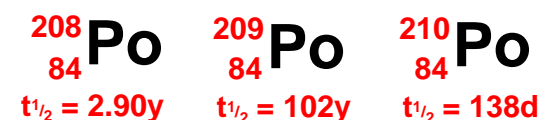
Selenium



Tellurium



Polonium



Allotropes: **6**

3 Se_8 nonmetallic, nonconducting.

1 hexagonal, "metallic", a photoconductor, most stable. Xerox.

1 Se_x amorphous, "red".

1 vitreous, glassy, black, brittle.

1

1 hexagonal, "metallic", a semiconductor.

2

1 cubic, α , "metallic", a conductor.

↓ 35°C

1 rhombohedral, β , "metallic", conductor.

Questions:

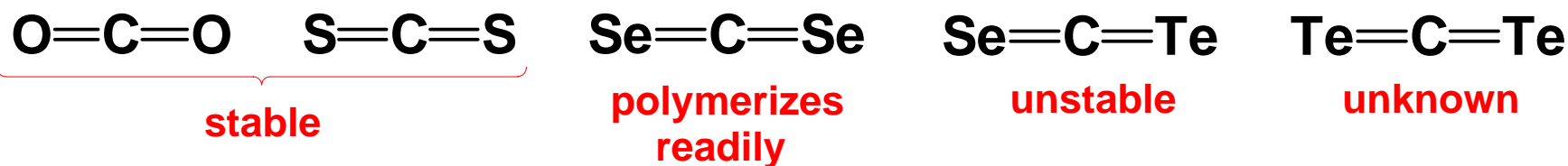
1 Why so many isotopes?

2 Why do abundances peak where they do?

Selenium, Tellurium, Polonium

Trends:

Stability of E=C bonds decreases down group.



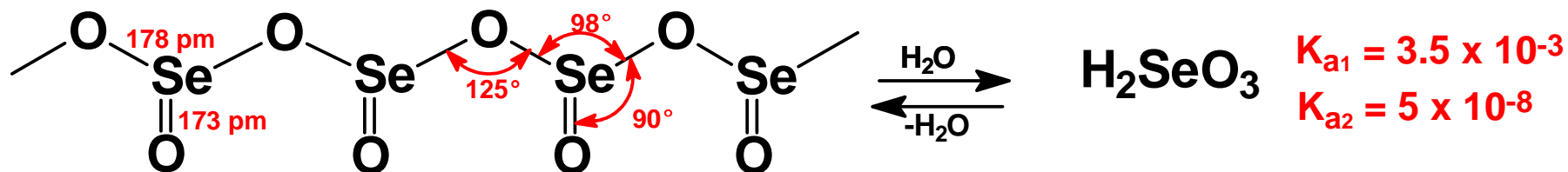
Stability of E=O bonds decreases down group.

SO_2
gas

SeO_2
CN = 3, chain polymer

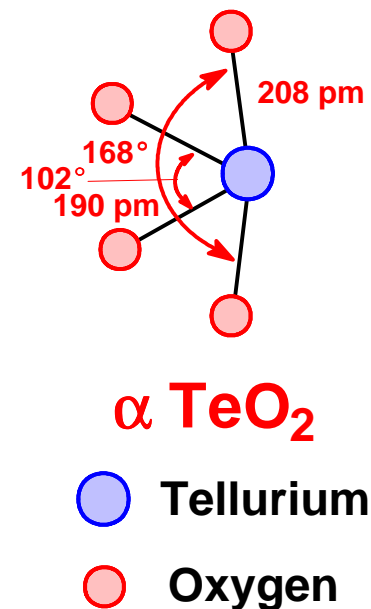
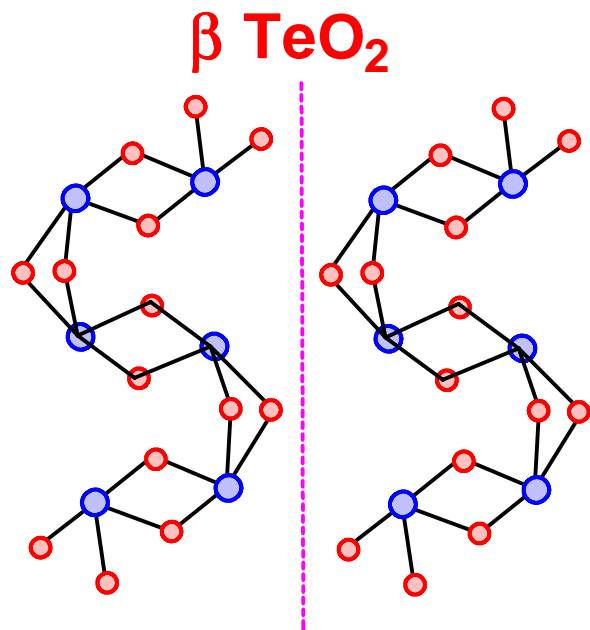
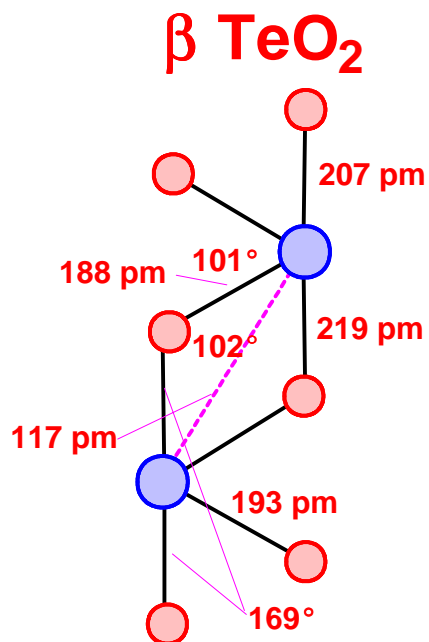
TeO_2
CN = 4, double chain polymer;
CN = 6, rutile str

PoO_2
"Fluorite"
 CaF_2
structure.



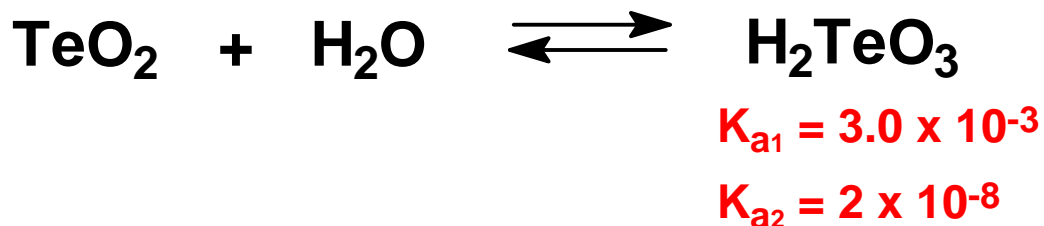
Structure is a corner linked set of flattened pyramids.

Selenium, Tellurium, Polonium



Pseudotrigonal bipyramids aggregate into layers.

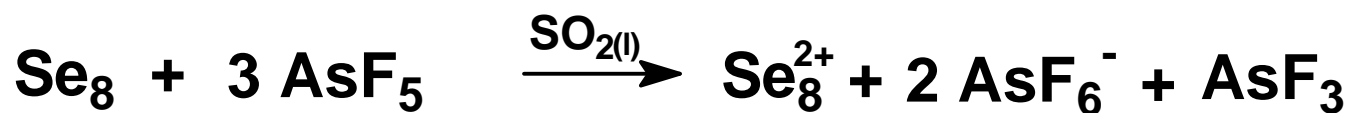
The nearly identical tbp of α TeO₂ has all oxygen atoms shared in a rutile structure.



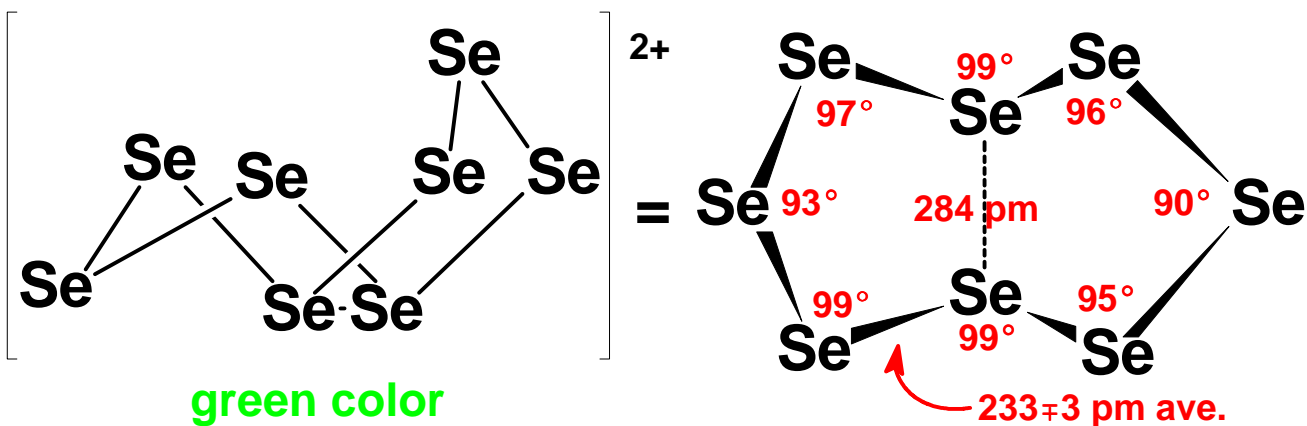
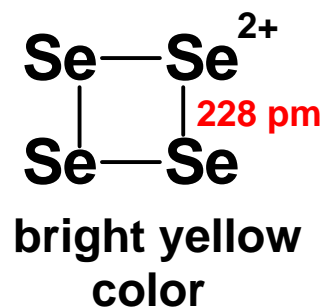
$$\angle_{\text{Te-O-Te}} = 140^\circ$$

Selenium & Tellurium Cations

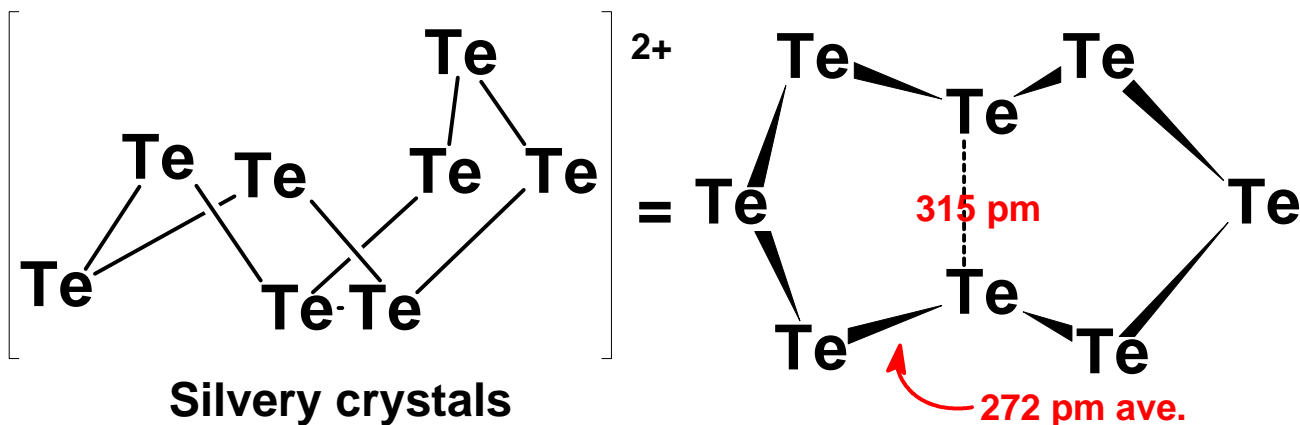
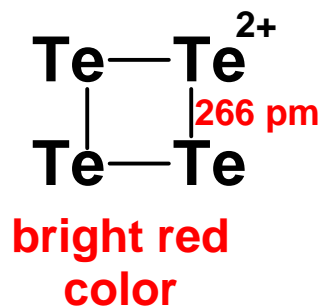
$\text{Se}_8 + \text{SO}_3 (\text{H}_2\text{SO}_4) \longrightarrow \text{Colored Solutions; Te is similar.}$



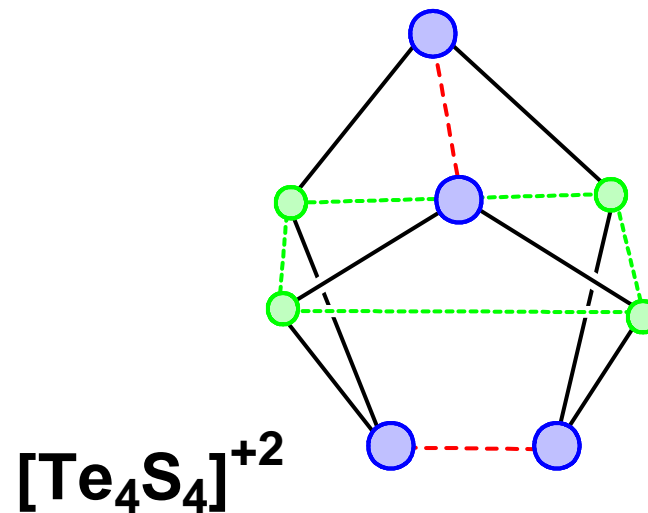
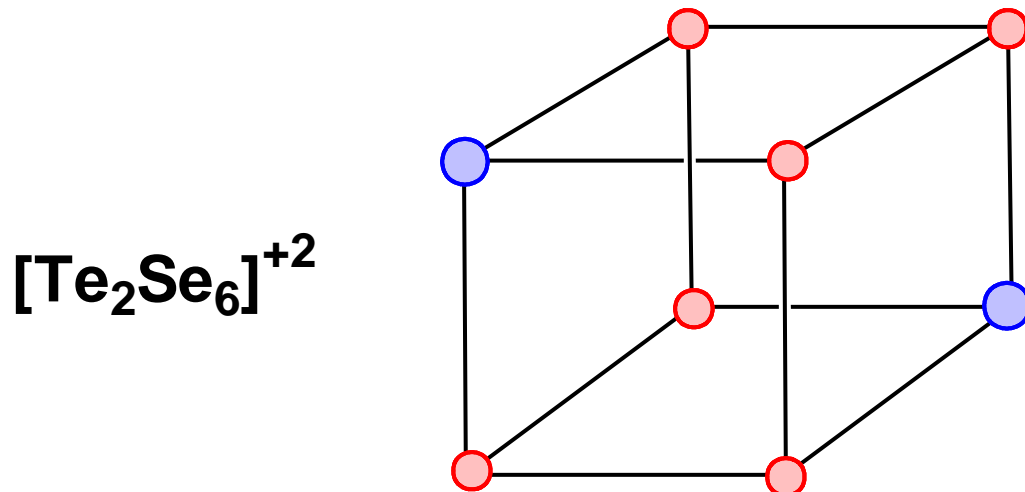
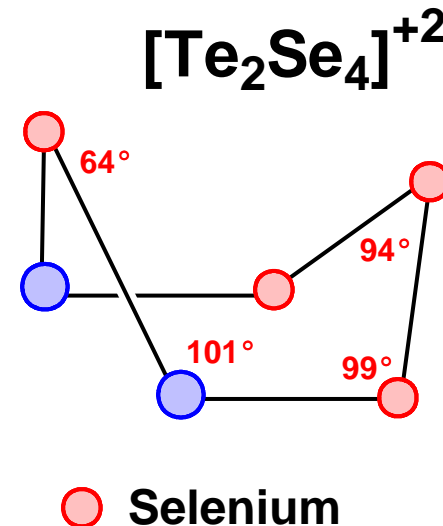
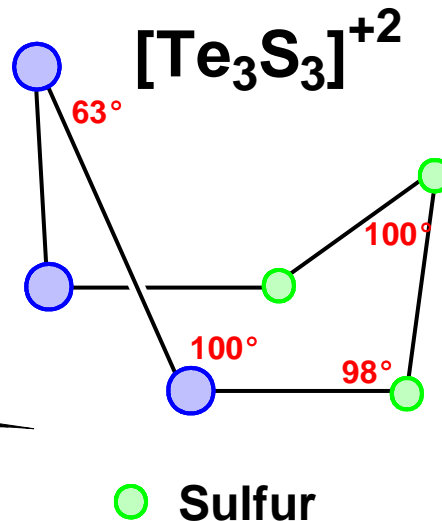
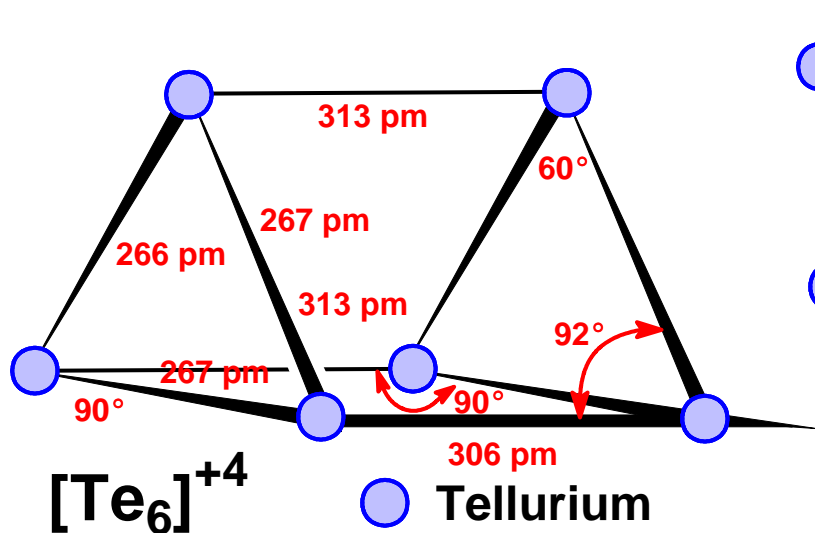
Sulfur Cations:



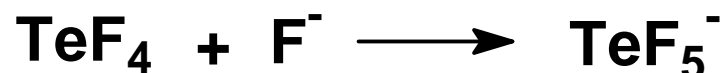
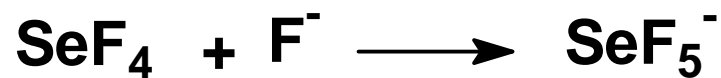
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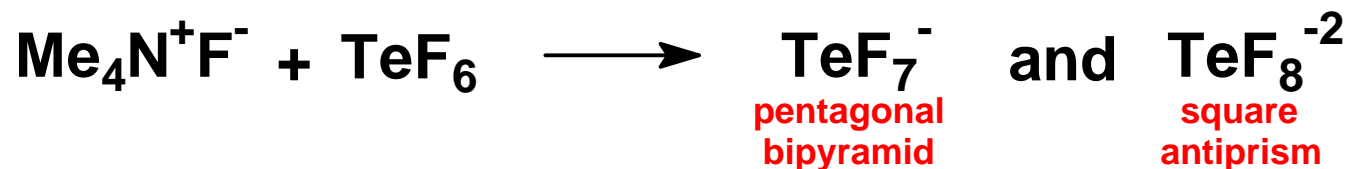
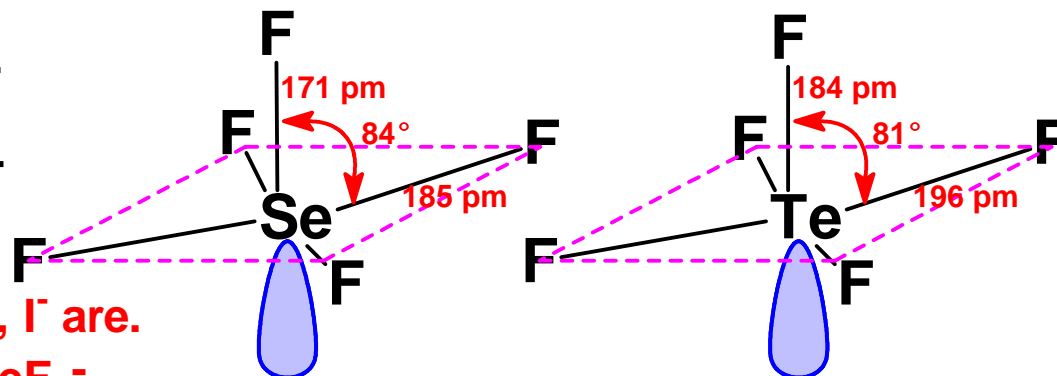
Other Selenium & Tellurium Cations



Fluorides of Se & Te

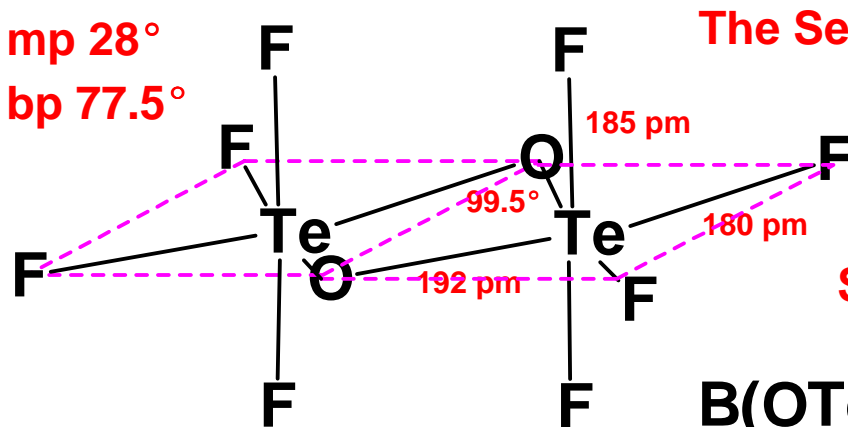


No MF_6^{-2} are known but Cl^- , Br^- , I^- are.
 SeF_5^- is much less stable than TeF_5^- .

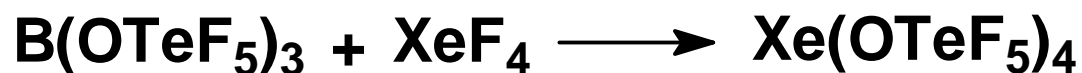
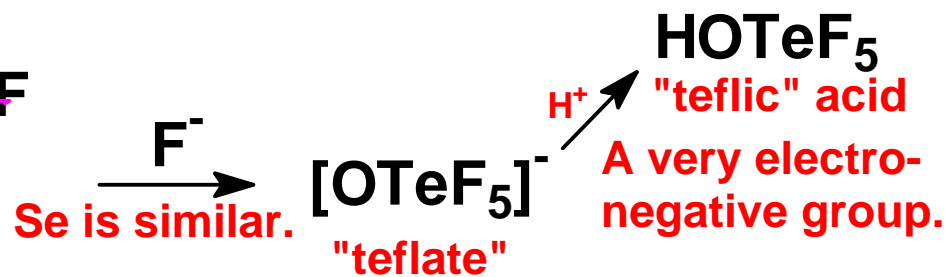


OMF_4 M = Se, Te are dimers.

mp 28°
 bp 77.5°



The Se analogue is much more reactive.



Boron transfers by bridging intermediates.