Announcements

To join clicker to class today (Clickers with LCD display join automatically):

- Turn on the Clicker (the red LED comes on).
- Push "Join" button followed by "20" followed by the "Send" button (switches to flashing green LED if successful).

- Exam Friday.
- Lab does not meet this week.

- Analytical reasoning quiz in discussion.
  - Sort and interpret data.
  - Use unfamiliar mathematical expression.
  - Reason by analogy.
  - Is one model preferred?

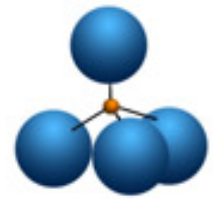
Review

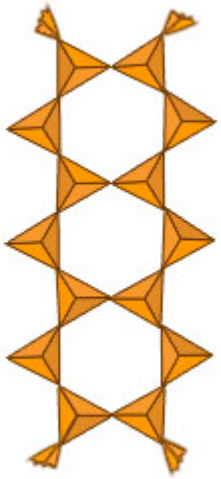
- In ionic lattices the positive ion fits into the holes between the negative ions.
  - In fcc there are both octahedral and tetrahedral holes.
  - Octahedral bigger (hold cations of > 50% size of anions).
  - Tetrahedral smaller (hold cations <40-50% size of anions).
  - If ions about same size tend to form scc (bcc) crystals.
- When calculating density of ionic crystal need to account for number of both types of ions in the unit cell.

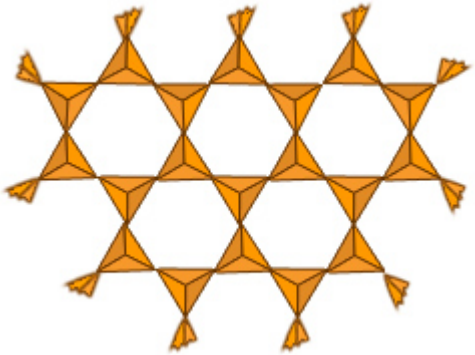
Review

- Molecular solids = individual molecules held together by intermolecular interactions (sometimes crystalline/well ordered).
- Allotrope = different forms of same element (graphite, C_{60} and diamond).
- Models of metallic bonding
  - Electron sea (Jellium) model.
  - Band theory of solids (also explains semi-conductors and insulators).
- Network solids = rigid array of bonded atoms. (diamond and silicates are examples).

Silicates



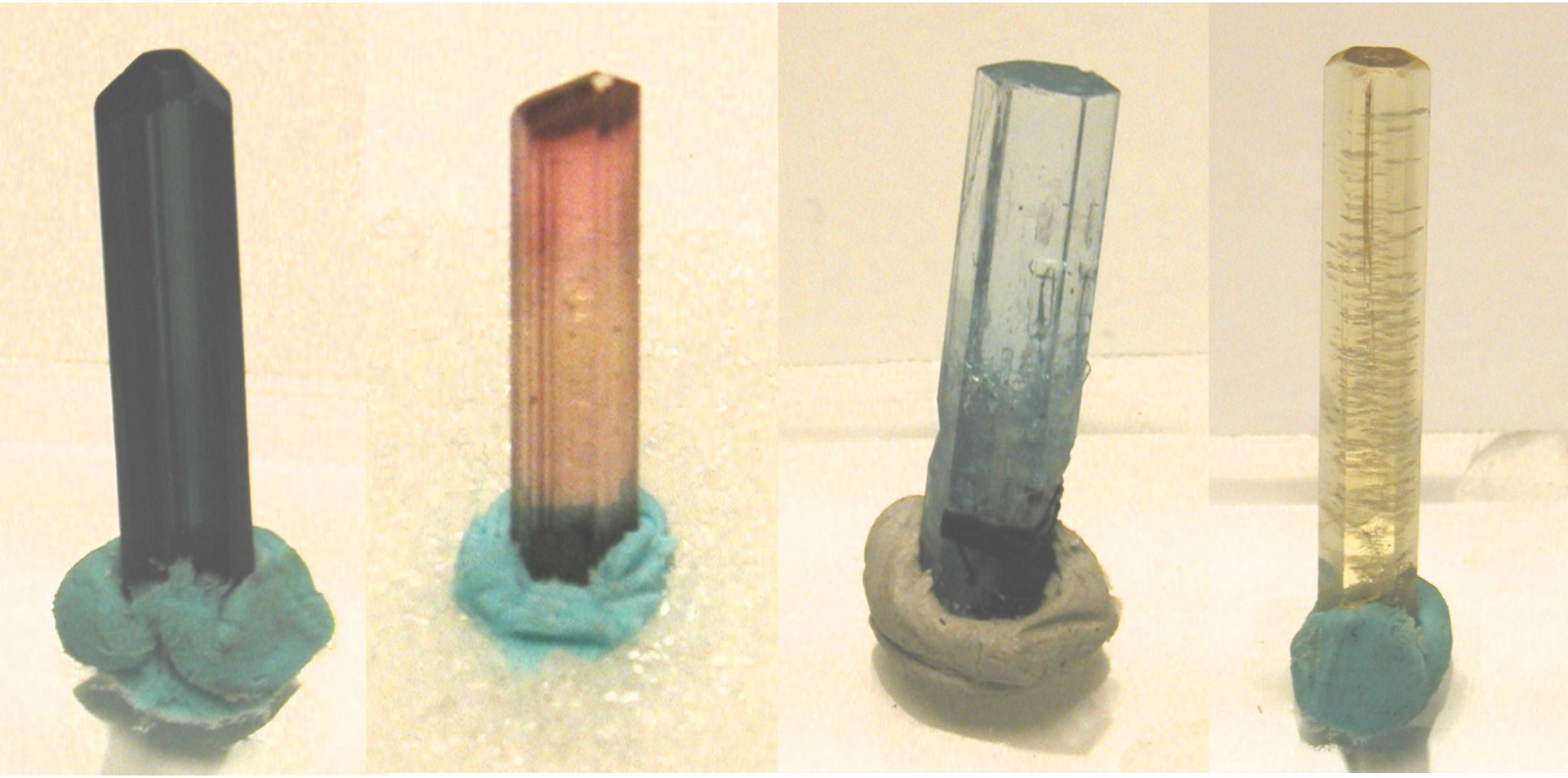




SiO_4^{4-} SiO_3^{2-} $Si_4O_{11}^{6-}$ $Si_2O_5^{2-}$

See Vision Learning Web Site (Minerals III) for better figures.

Some Silicate Gemstones
courtesy of Dr. Wacholtz



Crystal Field Splitting in Octahedral Complexes

Chang Figure 20.11

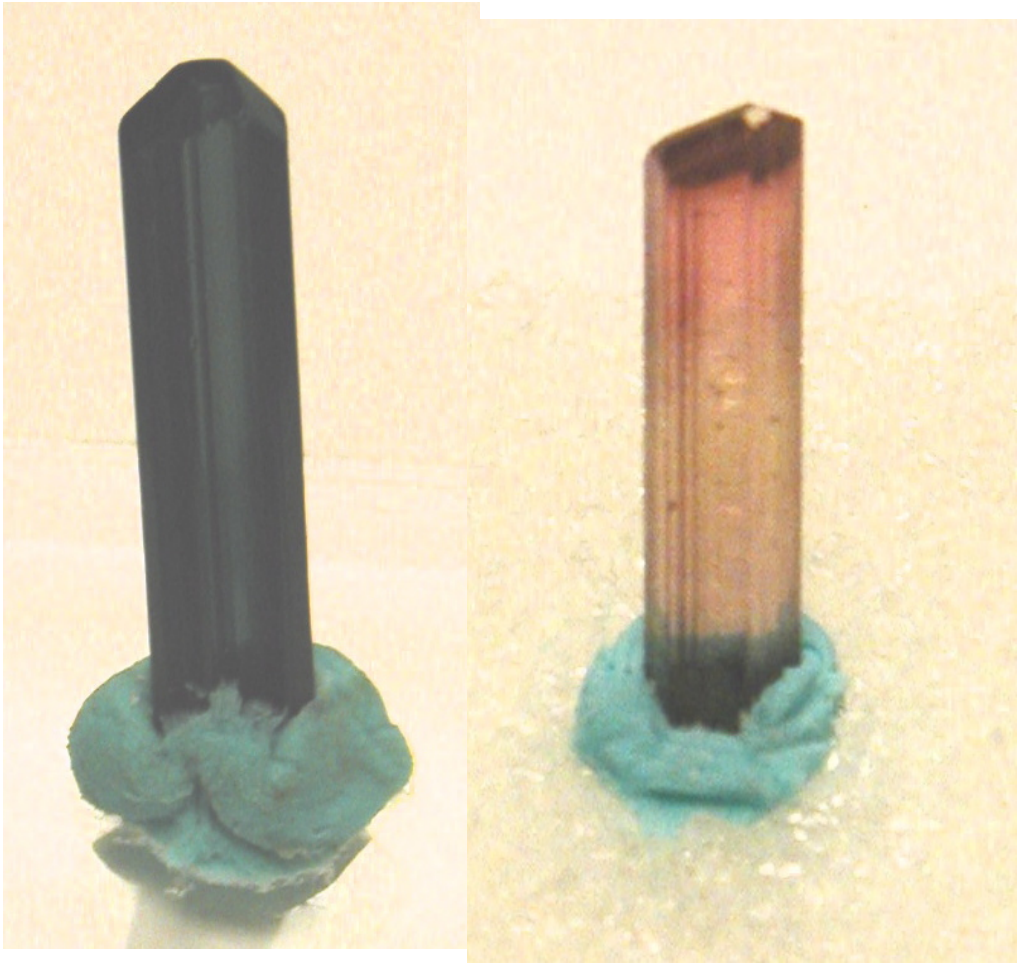
Chang Figure 20.12

Crystal Field Splitting in Tetrahedral Complexes

Chang Figure 20.18

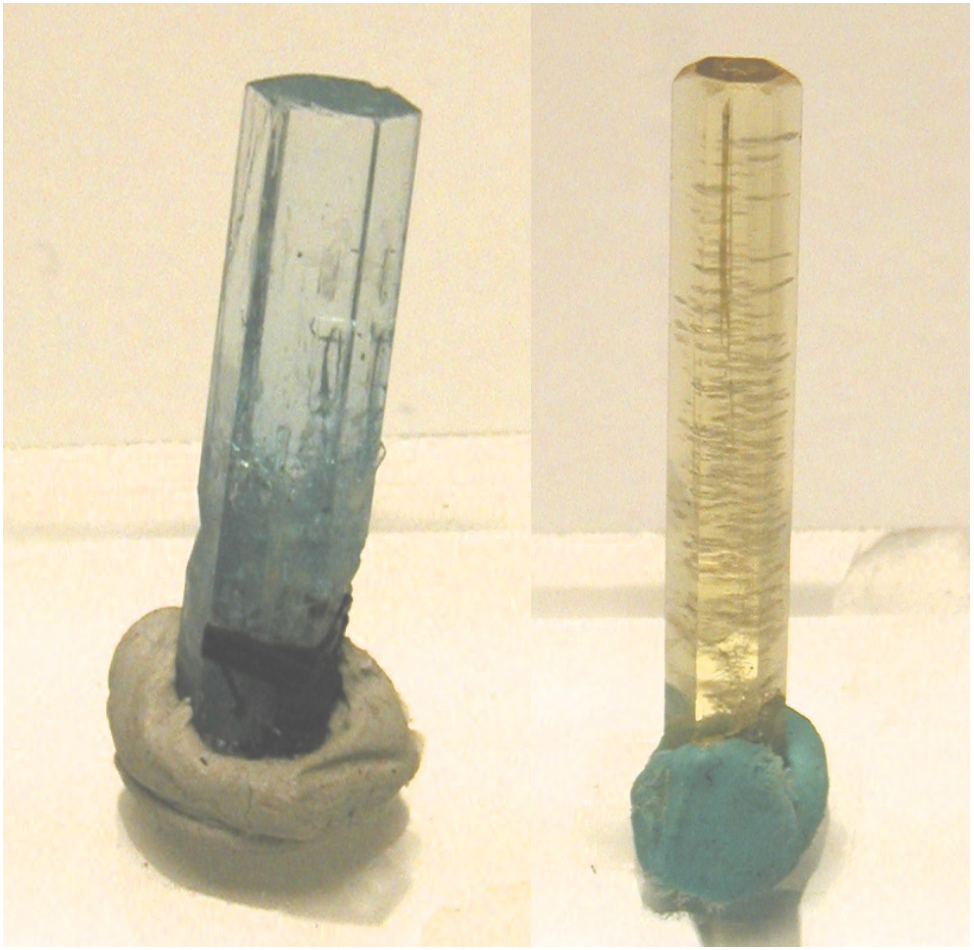
Tourmalines

$(Na,Ca)(Mg, Fe, Al, Mn, Li)_3Al_6(BO_3)_3(Si_6O_{18})(OH,F)_4$



Beryls

$Be_3Al_{2-x}(Cr, Fe)_xSi_6O_{18}$



Absorbance of Emeralds