GY 302: Crystallography & Mineralogy

Lecture 27: Class VIII-Silicates
Tektosilicates 3: Feldspathoids & Zeolites
Last Time

Class VIII Minerals (Tektosilicates)

1. Quartz Group
2. Feldspar Group (online)
Quartz Group

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Formula</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quartz Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quartz</td>
<td>SiO₂ (multiple varieties)</td>
<td>Trigonal</td>
</tr>
<tr>
<td>*Cristobalite</td>
<td>SiO₂</td>
<td>Tetragonal</td>
</tr>
<tr>
<td>Coesite</td>
<td>SiO₂</td>
<td>Monoclinic</td>
</tr>
<tr>
<td>Chalcedony</td>
<td>SiO₂</td>
<td>“non crystalline”</td>
</tr>
<tr>
<td>Opal</td>
<td>SiO₂·nH₂O</td>
<td>“non crystalline”</td>
</tr>
<tr>
<td>“Chert”</td>
<td>SiO₂ (multiple varieties)</td>
<td>“non crystalline”</td>
</tr>
</tbody>
</table>

Basic chemical composition: **SiO₂**
Tektosilicate Minerals (Quartz Group)

Quartz

\[ \text{SiO}_2 \]

Crystal: Hexagonal (Trigonal)
Pt. Group: 32
Habit: bipyramidal, massive, drusy etc.
SG: 2.65; H: 7
L: vitreous; Str: colourless
Col: colourless (varied)
Clev: poor [0110]
Optics: Uniaxial (-); \( \text{bir} = 0.009 \)
\( n_w = 1.544; n_e = 1.553 \)
Occurrence: widespread

Name Derivation: From the German “quarz” of uncertain origin
Quartz Varieties [SiO₂]

Agate - banded variety of chaledony
Amethyst - purple
Avanturine - translucent chalcedony
Carnelian - flesh red chalcedony
Cat's Eye - chatoyant
Chalcedony - microcrystalline quartz
Chert - cryptocrystalline quartz
Chrysoprase - apple green chalcedony
Citrine - yellow
Flint - microcrystalline quartz
Hornstone - flint
Jasper - red or brown chalcedony
Moss Agate - variety of chaledony
Plasma - green chalcedony
Prase - leek green chalcedony
Rock Crystal
Rose Quartz - rose colored
Sapphire Quartz - blue colored
Smoky Quartz - brown to black
Tiger Eye - entombed asbestos
“Chert”  
\[\text{SiO}_2\] 

Crystal: N/A  
Pt. Group: N/A  
Habit: microcrystalline  
SG: 2.09-2.65; H: 5.5 to 7  
L: dull, waxy; Str: white  
Col: varied  
Clev: none  
Optics: N/A  
Occurrence: sedimentary  

Chert is a rock name. Numerous varieties of chert have been identified.
Tektosilicate Minerals  (Quartz Group)

Lechatlerite (‘‘Fulgurite)  
[SiO$_2$+ contaminants]

Crystal: N/A  
Pt. Group: N/A  
Habit: Amorphous?  
SG: 2.20; H: 7.0?  
L: dull; Str: white  
Optics: N/A  
Col: white  
Clev: none  
Occurrence: lightning strikes

Lightning strikes may pass 1,000,000 volts of electricity into the ground fusing quartz sand into “glass”.

http://www.mindat.org/gphotos/0707699001129998806.jpg
Six Quartz Polymorphs

Displacive polymorphic transformations require relatively minor changes in the crystal lattice (e.g., modification of $\alpha$, $\beta$ or $\gamma$ crystallographic angles). There is generally no change in energy at the transformation threshold so polymorphic transformations are instantaneous and reversible.

If you heat “quartz” above 600 °C it transforms to the $\alpha$-polymorph (also known as high quartz). When the temperature falls below 600°C it transforms back to the $\beta$-polymorph (also known as low quartz).
Quartz Phase Diagrams

Olivine-Enstatite-Quartz System

Figure 2
Quartz is Pervasive....

....except for 2 situations:

1) Nephaline*-bearing rocks

\[ \text{NaAlSiO}_4 + 2\text{SiO}_2 \rightarrow \text{NaAlSi}_3\text{O}_8 \text{ (albite)} \]

2) Corundum-bearing rocks

\[ \text{Al}_2\text{O}_3 + \text{SiO}_2 \rightarrow \text{Al}_2\text{SiO}_5 \text{ (Sil/And/Ky)} \]

* A feldspathoid; you’ll hear about today
# Tektosilicate Minerals (Feldspars)

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Formula</th>
<th>System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Potassium Feldspar Group</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sanidine</td>
<td>KAlSi_3O_8</td>
<td>Monoclinic</td>
</tr>
<tr>
<td>Orthoclase</td>
<td>KAlSi_3O_8</td>
<td>Monoclinic</td>
</tr>
<tr>
<td>Anorthoclase (Na, K)AlSi_3O_8</td>
<td>Triclinic</td>
<td></td>
</tr>
<tr>
<td>Microcline</td>
<td>KAlSi_3O_8</td>
<td>Triclinic</td>
</tr>
<tr>
<td>v. Amazonite</td>
<td>KAlSi_3O_8</td>
<td>Triclinic</td>
</tr>
<tr>
<td><strong>Plagioclase Feldspars</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albite (Ab)</td>
<td>NaAlSi_3O_8</td>
<td>Triclinic</td>
</tr>
<tr>
<td>Oligoclase</td>
<td>An_{10-30}</td>
<td>Triclinic</td>
</tr>
<tr>
<td>Andesine</td>
<td>An_{30-50}</td>
<td>Triclinic</td>
</tr>
<tr>
<td>Labradorite</td>
<td>An_{50-70}</td>
<td>Triclinic</td>
</tr>
<tr>
<td>Bytownite</td>
<td>An_{70-90}</td>
<td>Triclinic</td>
</tr>
<tr>
<td>Anorthite (An)</td>
<td>CaAl_2Si_2O_8</td>
<td>Triclinic</td>
</tr>
</tbody>
</table>
The Feldspars

General Formula:
\[ X\text{AlSi}_3\text{O}_8 \text{ or } X\text{Al}_2\text{Si}_2\text{O}_8 \]

\[ X = \text{Ca}^{2+}, \text{Na}^+, \text{K}^+ \]

Two Varieties:
1) Alkali Feldspars
   (incl Orthoclase Group)
2) Plagioclase Feldspars
Tektosilicate Minerals (Feldspars)

Feldspars are also pervasive:

igneous minerals

http://depthome.brooklyn.cuny.edu/geology/core332/geofield.htm
Tektosilicate Minerals (Feldspars)

Feldspars are also common metamorphic minerals

http://depthome.brooklyn.cuny.edu/geology/core332/geofield.htm
The Feldspars

Alkali Feldspars

1) Orthoclase (incl. Adularia/Moonstone)
2) Microcline (incl. Amazonite)
3) Sanadine
4) Anorthoclase
5) Albite

We will group Albite in with the plagioclases
The Feldspars

Plagioclase Feldspars \( (\text{NaAlSi}_3\text{O}_8-\text{CaAl}_2\text{Si}_2\text{O}_8) \)

1) Albite (Ab) = \( \text{NaAlSi}_3\text{O}_8 \)  (An\(_{0-10}\) )
2) Oligoclase = \( \text{An}_{10-30} \)
3) Andesine = \( \text{An}_{30-50} \)
4) Labradorite = \( \text{An}_{50-70} \)
5) Bytownite = \( \text{An}_{70-90} \)
6) Anorthite (An) = \( \text{CaAl}_2\text{Si}_2\text{O}_8 \)
Tektosilicate Minerals (Feldspars)
Anorthoclase is an interesting mineral. It forms at temps above 600 ºC followed by rapid cooling.
Anorthoclase is an interesting mineral. It forms at temps above 600 °C followed by rapid cooling.

If the rate of cooling is slow, exsolution (separation into 2 mineral phases occurs).
Tektosilicate Minerals (Feldspars)

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Tektosilicate Minerals (Feldspars)

Phase diagrams to the rescue!
Tektosilicate Minerals (Feldspars)

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Phase diagrams to the rescue!
Tektosilicate Minerals (Feldspars)

Phase diagrams to the rescue!

Figure 4
Tektosilicate Minerals (Orthoclase Group)

Orthoclase (Adularia/Moonstone)

\[ \text{[KAlSi}_3\text{O}_8] \]

Crystal: Monoclinic
Pt. Group: 2/m
Habit: prismatic, blocky
SG: 2.56; H: 6
L: vitreous; Str: colourless
Col: pink, white, grey-green
Clev: perfect [001], good [010]
Optics: biaxial (-); bir=0.005-0.006
\[ n_\alpha =1.518; \ n_\beta =1.522, \ n_\gamma =1.523 \]
Occurrence: Felsic igneous rocks, metamorphic rocks (greenschist and above)

From the Greek orthos - "right" and kalo - "I cleave"
Tektosilicate Minerals (Orthoclase Group)

Microcline (Amazonite)

\[ \text{[KAlSi}_3\text{O}_8] \]

Crystal: Triclinic
Pt. Group: \( \overline{1} \)
Habit: prismatic, blocky
SG: 2.56; H: 6
L: vitreous/pearly; Str: colourless
Col: bluish-green, white, grey
Clev: perfect [001], good [010]
Optics: biaxial (-); \( \text{bir}=0.007 \)
\( n_{\alpha}=1.518; n_{\beta}=1.522, n_{\gamma}=1.525 \)
Occurrence: granite pegmatities

From the Greek \textit{mikron} - "little" and \textit{klinein} - "to stoop."
Tektosilicate Minerals  (Plagioclase Group)

Albite (Clevelandite)

$[\text{NaAlSi}_3\text{O}_8]$  

Crystal: Triclinic  
Pt. Group: $\bar{1}$  
Habit: prismatic, blocky  
SG: 2.62; H: 7  
L: vitreous; Str: colourless  
Col: white (greyish, greenish, bluish)  
Clev: perfect [001], good [010]  
Optics: biaxial (-); bir=0.007  
$n_\alpha=1.518$; $n_\beta=1.522$, $n_\gamma=1.523$  
Occurrence: granite pegmatities etc.

From the Latin, *albus*, in allusion to the common color.
Oligoclase (Sunstone) 
\[\text{An}_{10-30}\]

Crystal: Triclinic  
Pt. Group: \( \bar{1} \)  
Habit: massive, blocky  
SG: 2.65; H: 7  
L: vitreous; Str: colourless  
Col: white (grey, brown, yellow)  
Clev: perfect [001], good [010]  
Optics: biaxial (+); bir=0.009  
\( n_\alpha=1.533; n_\beta=1.537, n_\gamma=1.542 \)  
Occurrence: granite pegmatities etc.  

From the Greek, *oligos* and *kasein*, "little cleavage."
Tektosilicate Minerals (Plagioclase Group)

Labradorite (Spectrolite)  
\[ \text{An}_{50-70} \]

Crystal: Triclinic  
Pt. Group: \( \overline{1} \)  
Habit: granular, blocky striated)  
SG: 2.69; H: 7  
L: vitreous; Str: colourless  
Col: colourless, grey (irridescent)  
Clev: perfect [001], good [010]  
Optics: biaxial (+); \( \text{bis} = 0.009 - 0.010 \)  
\( n_\alpha = 1.554; n_\beta = 1.559, n_\gamma = 1.562 \)  
Occurrence: Mafic igneous rocks, some metamorphic rocks

From the Greek, oligos and kasein, "little cleavage."
Tektosilicate Minerals (Plagioclase Group)

**Anorthite** (Indianite)  
[An]

Crystal: Triclinic  
Pt. Group: \( \overline{1} \)  
Habit: euhedral-blocky striated)  
SG: 2.73; H: 6  
L: vitreous; Str: colourless  
Col: colourless, white, grey (reddish)  
Clev: perfect [001], good [010]  
Optics: biaxial (-); \( \Delta n = 0.011 - 0.012 \)  
\( n_\alpha = 1.572; n_\beta = 1.579, n_\gamma = 1.583 \)  
Occurrence: Mafic igneous rocks, some metamorphic rocks

From the Greek, *an* + *orthos*, "not upright" in allusion to the oblique crystals.
Today’s Agenda

Class VIII Minerals (Tektosilicates)

1. Feldspathoids
2. Zeolites
Tektosilicate Minerals (Feldspathoids)

### Mineral | Formula | System
--- | --- | ---
**Feldspathoids (38)**
Leucite* | KAlSi$_2$O$_6$ | Tetragonal
Nepheline* | NaAlSiO$_4$ | Hexagonal
Sodalite* | Na$_8$(AlSiO$_4$)$_6$Cl$_2$ | Isometric
Lazurite | (Na,Ca)$_8$(AlSiO$_4$)$_6$(SO$_4$,S,Cl)$_2$ | Isometric

* groups

- Feldspathoids contain 2/3 the silica that feldspars do (hence the name).
- They form in alkali-rich igneous rocks in place of feldspars when there is an Si$^{4+}$ deficiency
- You **never** find feldspathoids and quartz together in the same rock

$$\text{NaAlSiO}_4 \text{ (nepheline)} + 2\text{SiO}_2 \rightarrow \text{NaAlSi}_3\text{O}_8 \text{ (albite)}$$
Tektosilicate Minerals (Feldspathoid)

**Leucite**

\[\text{KAlSi}_2\text{O}_6\]

Crystal: Tetragonal  
Pt. Group: 4/m  
Habit: equant crystals  
SG: 2.47; H: 6  
L: vitreous; Str: white  
Col: colourless, grey, yellow  
Clev: Indistinct [110]  
Optics: isotropic; n=1.508-1.511  
Occurrence: Felsic igneous rocks

From the Greek “leukos” for white

http://webmineral.com
Tektosilicate Minerals (Feldspathoids)

Nepheline
[(Na,K)AlSiO₄]

Crystal: Hexagonal
Pt. Group: 6
Habit: prismatic, slender prisms
SG: 2.59; H: 6
L: vitreous-greasy; Str: white
Col: white, grey, brown, reddish
Clev: poor [1010]
Optics: uniaxial (-); bir=0.003-0.005
  \( n_e = 1.528; \quad n_w = 1.531 \)
Occurrence: Si-poor igneous rocks

From the Greek *nephele*, "cloud," because it becomes clouded when put in strong acid

http://webmineral.com
Sodalite

\[ \text{Na}_8\text{Al}_6\text{Si}_6\text{O}_{24}\text{Cl}_{12} \]

Crystal: Isometric
Pt. Group: \( 4 \overline{3}m \)
Habit: massive, vein-fill
SG: 2.29; H: 6
L: vitreous-greasy; Str: white
Col: azure blue, white, pink, grey
Clev: poor \([110]\)
Optics: isotropic; \( n=1.483-1.484 \)
Occurrence: Nepheline syenites

Named on the basis of its sodium content
Lazurite

\[ \text{Na}_3\text{Ca(Al}_3\text{Si}_3\text{O}_{12})\text{S} \]

Crystal: Isometric
Pt. Group: \( \overline{4}3m \)
Habit: massive
SG: 2.4; H: 5.5
L: vitreous-dull; Str: light blue
Col: azure blue, green-blue, pale blue
Clev: poor [110]
Optics: isotropic; \( n=1.500-1.522 \)
Occurrence: Contact Meta-limestone

From the Persian lazward - "blue."
Lapis Lazuli
Lazurite + calcite + pyrite

Mughal Lapis Lazuli Sculpture of an Elephant - PF.6147
Origin: India
Circa: 16th Century AD to 19th Century AD
Dimensions: 14.25" (36.2cm) high
Medium: Lapis Lazuli
Tektosilicate Minerals (Feldspathoids)

Lapis Lazuli
Lazurite + calcite + pyrite

Cult image of the god Ptah, Dynasty 22–early Dynasty 26 (ca. 945–600 B.C.)
Egyptian
Lapis lazuli; H. 2 1/4 in. (5.6 cm)


http://www.idoincorporated.com
Painters of the Renaissance had a strong affinity for the ultramarine pigment due to its vivid rich consistency.
# Tektosilicate Minerals (Zeolites)

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<tr>
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<tbody>
<tr>
<td><strong>Zeolite Group</strong> (true zeolites: 59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heulandite</td>
<td>$(\text{Na}, \text{Ca})_2\cdot3\text{Al}<em>3(\text{Al, Si})<em>2\text{Si}</em>{13}\text{O}</em>{36} \cdot 12\text{H}_2\text{O}$</td>
<td>Monoclinic</td>
</tr>
<tr>
<td>Stilbite</td>
<td>$\text{NaCa}<em>2\text{Al}<em>5\text{Si}</em>{13}\text{O}</em>{36} \cdot 14\text{H}_2\text{O}$</td>
<td>Monoclinic</td>
</tr>
<tr>
<td>Laumontite</td>
<td>$\text{CaAl}_2\text{Si}<em>4\text{O}</em>{12} \cdot 4\text{H}_2\text{O}$</td>
<td>Monoclinic</td>
</tr>
<tr>
<td>Chabazite</td>
<td>$\text{CaAl}_2\text{Si}<em>4\text{O}</em>{12} \cdot 6\text{H}_2\text{O}$</td>
<td>Trigonal</td>
</tr>
<tr>
<td>Analcime</td>
<td>$\text{NaAlSi}_2\text{O}_6 \cdot \text{H}_2\text{O}$</td>
<td>Isometric</td>
</tr>
<tr>
<td>Natrolite</td>
<td>$\text{Na}_2\text{Al}_2\text{Si}<em>3\text{O}</em>{10} \cdot 2\text{H}_2\text{O}$</td>
<td>Orthorhombic</td>
</tr>
</tbody>
</table>
Metamorphic facies

Temperature
Low High

Pressure
Low High

Zeolite facies
Hornfels facies
Greenschist
Amphibolite
Granulite
Partial melting
Eclogite facies
There are more than 50 “zeolite” minerals that are now subdivided into “true zeolites” (see diagram to right) and related species.

Many single minerals are further subdivided into cation-rich members. e.g.,

Ca-Heulandite
Na-Heulandite
K-Heulandite
Ba-Heulandite
Tektosilicate Minerals (Zeolites)

You can also classify zeolites according to chemical criteria like water composition.

Beware Eronite; it’s fibrous and is deemed a carcinogen.
Zeolite minerals are cool! They are nanoporous, built up from silicon and aluminum tetrahedra to form a regular three-dimensional framework.
Zeolites contain channels or pores of molecular diameter, typically around 0.5 nanometers.
Reactant molecules may wander, or diffuse, into these pores and undergo chemical reactions, thus being transformed into desired products.
Tektosilicate Minerals (Zeolites)

Or if your prefer; zeolites are nannosieves that can remove nasty stuff.

• Odors (cat litter, vomit)
Tektosilicate Minerals (Zeolites)

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- Odors (cat litter, vomit)
- Salts in water (Ca$^{2+}$, Mg$^{2+}$)

http://academic.sun.ac.za/unesco/
Tektosilicate Minerals (Zeolites)

Or if your prefer; zeolites are nannosieves that can remove nasty stuff.

• Odors (cat litter, vomit)
• Salts in water (Ca$^{2+}$, Mg$^{2+}$)
• Human Health?

http://www.cartoonstock.com/newscartoons/cartoonists/efi/lowres/efin538l.jpg
LIQUID ZEOLITE™

LIQUID ZEOLITE™ is a natural fast-acting super detoxifier. It is safe to use: LIQUID ZEOLITE™ comes from the only ore supply that's been approved as safe for consumption by humans. In addition, it has been processed in such a way that it can NEVER withdraw necessary minerals or elements from your body — only the harmful ones. In fact, it actually helps to remineralize your cells. 100% Pure Clinoptilolite: LIQUID ZEOLITE™ is composed 100% of the zeolite subgroup called "clinoptilolite" — the type of zeolite that has generated such amazing results in laboratory testing.
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It is chemical free: LIQUID ZEOLITE™ is processed without chemicals. Through a natural, proprietary process, concentrated organic humic acid molecules have "naturally digested" the zeolite, holding it in permanent suspension. LIQUID ZEOLITE™ is chemical-free, no chemicals, solvents or heat-treating methods are used in our proprietary natural holistic manufacturing process.

It has maximum bioavailability: Because the humic acid in LIQUID ZEOLITE™ is in organic, interdimensional form, and because the zeolite is actually suspended in the humic molecules, 100% of LIQUID ZEOLITE™ is carried into the cells.

It has anti-aging properties: Because LIQUID ZEOLITE™ uses interdimensional humic acid to carry the zeolite to your cells, the antiaging properties of organic humic acid "come with." There is no substitute for organic humic acid to revitalize our cells and reverse cellular degeneration.

What makes natural intracellular LIQUID ZEOLITE™ in humic acid better than other major brands of liquid zeolite? Many other brands use chemicals and solvents or heat treatment methods to process their zeolite into a liquid form. Natural intracellular LIQUID ZEOLITE™ utilizes the newest most advanced manufacturing process of using humic acid (a highly regarded organic medium) which enables the zeolite to penetrate cell walls.
LIQUID ZEOLITE™

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Tektosilicate Minerals (Zeolites)

Analcime

\[ \text{[NaAlSi}_2\text{O}_6 \cdot \text{H}_2\text{O]} \]

Crystal: Isometric*  
Pt. Group: \(4/m \overline{3} 2/m*\)  
Habit: dodecahedral*  
SG: 2.3; H: 5  
L: vitreous; Str: white  
Col: white (various shades)  
Clev: weak [100], [010], [001]  
Optics: biaxial (?)*; \(\text{bir}=0.0010\)  
\(n_\alpha=1.479; n_\beta=?, n_\gamma=1.48\)

* inconsistent data; isometric or triclinic?

From the Greek “adynatos” meaning weak, referring to a weak electrical charge developed on rubbing
Heulandite

\[(\text{Na, Ca})_{2-3}\text{Al}_3(\text{Al, Si})_2\text{Si}_{13}\text{O}_{36} \cdot 12\text{H}_2\text{O}\]

Crystal: Monoclinic
Pt. Groups: m, 2
Habit: blocky to tabular
SG: 2.2; H: 3 to 3.5
L: vitreous, pearly; Str: white
Col: white (reddish, brownish, greyish)
Clev: perfect [010]
Optics: biaxial (+) bir=0.003
\[n_\alpha=1.476; n_\beta=1.479, n_\gamma=1.479\]

Name Derivation: After English mineral collector, John Henry Heuland (1778-1856).
Natrolite

\[ \text{Natrolite} \quad [\text{Na}_2\text{Al}_2\text{Si}_3\text{O}_{10}\cdot2\text{H}_2\text{O}] \]

Crystal: Orthorhombic  
Pt. Groups: mm2, (2mm)  
Habit: acicular, bladed  
SG: 2.25; H: 5-5.6  
L: vitreous, silky; Str: colourless  
Col: white (reddish, brownish, yellowish)  
Clev: perfect [110], weak [010]  
Optics: biaxial (+) bir=0.0120-0.0130  
\[ n_\alpha = 1.473; \quad n_\beta = 1.476, \quad n_\gamma = 1.485 \]

Name Derivation: From the Greek *natron*, "soda," in allusion to sodium content.
Chabazite
[CaAl$_2$Si$_4$O$_{12}$·6H$_2$O]

Crystal: Triclinic
Pt. Group: 1
Habit: pseudo-cubic, drusy
SG: 2.09; H: 4
L: vitreous; Str: white
Col: white (pinkish, reddish, brownish, greyish)
Clev: weak [1011]
Optics: biaxial (+/-) ; bir=0.002-0.005
   $n_\alpha=1.478$; $n_\beta=1.480$, $n_\gamma=1.480$
Occurrence: basalt void-fills

From the greek *chabazios*, tune or melody, one of twenty stones named in the poem Peri lithos, which extolled the virtues of minerals.
Stilbite

$$\text{NaCa}_2\text{Al}_5\text{Si}_{13}\text{O}_{36} \cdot 14\text{H}_2\text{O}$$

Crystal: Monoclinic
Pt. Group: 2/m
Habit: fibrous (wheat sheaf)
SG: 2.15; H: 3.5-4
L: vitreous, pearly; Str: white
Col: cream, peach, “salmon”
Clev: perfect [010]
Optics: biaxial (-) ; bir=0.010-0.013
  $$n_\alpha=1.479; \ n_\beta=1.485, \ n_\gamma=1.489$$
Occurrence: basalt void-fill

From the Greek stilbe - "luster" in allusion to the pearly to vitreous luster.
Today’s Stuff To Do

1. Poster Session next Tuesday
   Pick up posters
2. Begin studying for your mineral final
3. Do online class survey (bonus!!)

Next Time

1. 3 minute poster presentations during class
2. Poster Session 1:00 to 3:00 PM