Mineralogy

Exercise 1

*Purpose:* The definition of a mineral includes that it must have a crystalline solid, which means the material has a regular internal arrangement of elements or symmetry. We can describe the regular internal arrangement of elements, which helps us better understand how minerals form and provide a way to classify minerals. Different groups of minerals have different internal arrangements and symmetry. The internal order of a crystal structure can be thought of as a motif or group of atoms repeated on a 3D frame. The group of atoms is called a unit cell, which is the smallest unit of a mineral that can be repeated to generate the whole structures (think lego blocks). The internal forms can be described using 32 symmetry elements, which form the 32 point groups or crystal classes.

*Objective:* In this assignment you will practice plotting graphical representations of different symmetry elements for different crystal classes, describe each symmetry element, and draw a corresponding motif pattern. You will do this using the program MATLAB and the MTEX toolbox.

*Task:* Follow the procedure below to plot 6 crystal classes, 1 from each crystal system. Once you have plotted your chosen 6 crystal classes, describe each symmetry element and draw a motif pattern that follows the corresponding symmetry elements.

*Procedure:*

1. Download MATLAB:
   1. https://www.mathworks.com/academia/tah-portal/university-of-southern-mississippi-40688751.html
2. Download MTEX:
   1. http://mtex-toolbox.github.io/
3. Run MTEX in MATLAB
4. Choose your 6 crystal classes and plot in MATLAB using these two lines of code:

*cs = crystalSymmetry(‘4’)*

*plot(cs,‘upper’)*

“4” is the crystal class, so replace that with the one you chose.

1. Print the resulting plot.
2. Describe the symmetry elements in the plot.
3. Draw a motif that represents each symmetry element.
4. Repeat 4 through 7 using a different crystal class from the different crystal systems.

*Products:*

1. 6 plots (1 from each crystal class)
2. 6 descriptions
3. 6 motif drawings