Al- Karkh University of Science

College of Remote Sensing and Geophysics

Department of Geophysics

Crystallography and Mineralogy

Lec. 6: Common Rock- Forming Minerals

Assist. Prof. Dr. Aqeel A. Al- Zubaidi

Common Rock- Forming Minerals:

Mineral Groups

Most minerals are made up of a cation (a positively charged ion) or several cations and an anion (a negatively charged ion (e.g., S^{2-})) or an anion complex (e.g., SO_4^{2-}). For example, in the mineral hematite (Fe_2O_3), the cation is Fe^{3+} (iron) and the anion is O^{2-} (oxygen). Minerals classify on the basis of their predominant anion or anion to many group. These include oxides, sulphides, carbonates, silicates, and others. Silicates are the predominant group in terms of their abundance within the crust and mantle.

1. Native elements, gold and copper.
2. Halides precipitate (salt).
3. Oxides (metal +oxygen).
4. Sulfides (metal +sulfur).
5. Sulfates (So4)-2
6. Carbonates (Co3)-2
7. Silicate (SiO4)-4

IMPORTANT ROCK-FORMING MINERALS

(or mineral identification for real life) this is supplemental reading material to that in the lab manual, but read the lab manual chapters first Unless you're really totally lucky (or you're robbing a gem store), you are not going to be finding museum-quality or even lab-quality samples of individual minerals lying around. Instead, there will be mineral grains within rocks, and in most cases you won't be able to pull them out for the types of analyses you've been doing so far.

If you are going to start classifying rocks, this list is short, but you can identify most rocks with only 8 of them. Here are the 8 minerals you need to be able to identify in order to classify ~90% of all rocks.

1. Quartz, 2.K- feldspar (alkali feldspar), 3.plagioclase feldspar, 4.Olivine, 5.Pyroxene, 6.Amphibole, 7.Mica (Muscovite or Biotite), and 8.Calcite and Aragonite.

What follows are some simple rules for identifying these 8 important minerals. These are the rules you might use out in the field where you don't have access to fancy analytical equipment. Many times these particular properties are visible only with a hand lens.

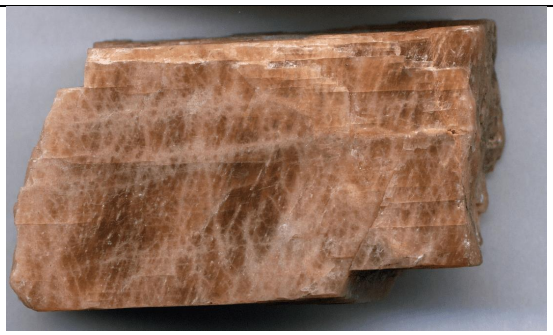
1.Quartz: Quartz is hard, and it will scratch glass and steel (a pocketknife, for example). Quartz is almost always very clear (you can see into an individual grain), fresh-looking, and shiny (but not metallic). Sometimes quartz is milky,

pink, grey, blue, etc.). Because quartz does not have cleavage, the shiny surfaces are not flat, and it is conchoidal fracture. Quartz grains typically have irregular shapes.

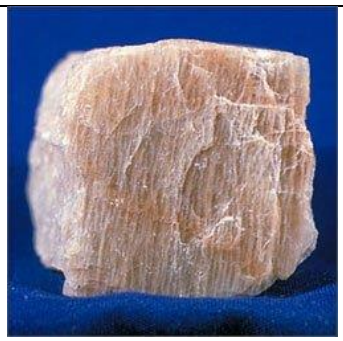
Rose Quartz

Purple Quartz

2. Potassium feldspar: K- feldspar, always has milky color, non-transparent, and you can see little wavy, milky veins (more properly called “exsolution lamellae”. Note that these lamellae are almost always lighter in tone than the surrounding part of the mineral, and although they may be somewhat parallel to each other, they are not perfectly straight or parallel.
Potassium feldspar is usually whitish or reddish. It is common for potassium feldspar to exhibit one or more cleavage planes, and/or to be in grains with reasonably nice crystal forms. You can also find potassium feldspar grains that have completely irregular forms. Potassium feldspar is reasonably hard - it might scratch your knife.



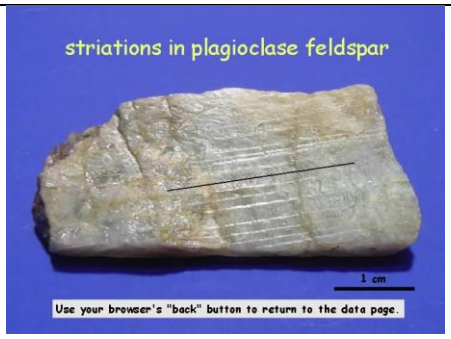
K- Feldspar



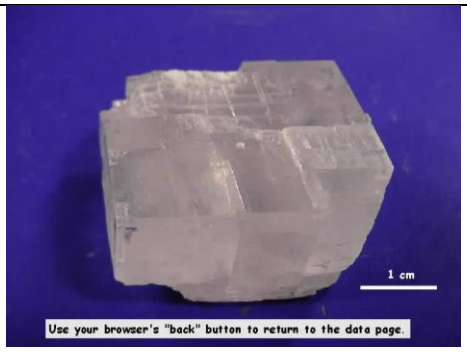
K- Feldspar

3. Plagioclase feldspar: Fresh plagioclase feldspar has a translucent to shiny-white appearance, so if you aren’t careful it can be confused with white K-feldspar or clear quartz. Plagioclase feldspar is very straight and very parallel striations (lines) that are visible. Plagioclase feldspar is about as hard as

potassium feldspar. The cleavage plane is always visible. If plagioclase feldspar is weathered, it becomes chalky-white rather than translucent or shiny-white.



plagioclase feldspar



plagioclase feldspar

4. Olivine: Olivine has a very distinctive olive-green color. It is usually a bit more yellowish, or lighter-colored grains. Fresh olivines have a shiny clear appearance, but it doesn't take much exposure to surface conditions and weathering for them to look on the surface. Really weathered olivines are yellow-brown. If it is an iron-rich olivine it may be almost black, but these are uncommon. Olivine crystals are can be irregularly shaped, but sometimes they show good form as slightly elongate crystals.


Olivine

Olivine

5. Pyroxene: Pyroxene is actually a very dark green color but it appears black. It is typically somewhat shiny, and sometimes shows two cleavage planes that meet at ~90°. The cleavage planes are not really nice and smooth. Pyroxene weathers more slowly than olivine and it is common to find fresh- surface of pyroxenes with weathered- surface of olivines in the same rock.

Pyroxene

Pyroxene

6. Amphibole: Amphibole is also very dark green but almost appears to be shiny and black. Amphibole commonly forms elongate grains that are at least 2 or 3 times as long as they are wide. It has two cleavage planes that meet at 56° and 124° angles. In these cases it might be difficult to difference from biotite mica, except that biotite is very soft and can be scratched or broken easily.

Amphibole

Amphibole

7. Mica: Micas are usually easy to identify because they show one perfect cleavage plane that causes the grains to break into thin shiny sheets. Hold a rock (mineral) and move its orientation, if you see bright light, these are probably mica cleavage planes. sheets of mica can be seen with a hand lens. Also, micas are soft, and you can scratch them sometimes with your fingernail and always with a pocket knife. The two most common micas are: 1.biotite, which is very dark brown to black, and 2.muscovite, which is clear to dull silver (although it is not a metallic mineral).

Biotite Mica

Muscovite Mica

8. Calcite and Aragonite: These two minerals are two forms of the same chemical composition- calcium carbonate. Calcite and Aragonite can be formed by 1.organic processes (limestone reefs and most sea shells are aragonite to begin with, but change naturally to calcite over time), and also by 2.inorganic processes (beautiful calcite crystals often form in veins where water percolates through limestone). In the organic cases, individual mineral grains are almost always too small to distinguish, and the best thing to do to see if calcite or aragonite are present is to put a small drop of dilute HCl (hydrochloric acid) on the rock. If it fizzes, then probably you have some calcite or aragonite. Sometimes also, on a weathered limestone surface, you will see what looks like craggy ridges and grooves, kind of like a fingerprint (but more straight).

Calcite

Aragonite