**April 12, 2021**

**Feldspars**

**Figure 1 - Feldspar**
**Credit: Dave Dyet, 2007, Wikimedia Commons**

Feldspar is a general name for a family of minerals that have historically been grouped together because they have similar characteristics in the field. They are commonly divided into two groups: plagioclase feldspars and alkali feldspars. About half the minerals in the Earth's crust are feldspar of one kind or another. Feldspars are found in most igneous and metamorphic rocks. Among sedimentary rocks, feldspars are rare except in arkose, a sandstone where many of the grains are feldspar. Figure 2, shows the relative abundance of the most common rock forming minerals.

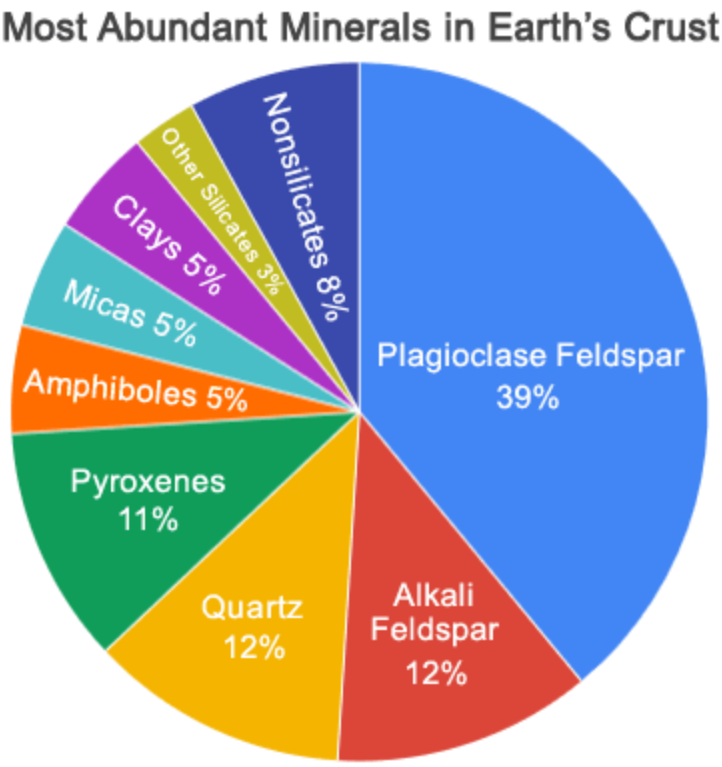


**Figure 2 - Mineral Abundance**

**General Properties**

In color, feldspars are usually white, pink, gray or brown. However they can also be colorless, yellow, orange, red, black, blue, green. One variety, labradorite, has a distinctive blue colour, as shown in Figure 3. Feldspars are usually translucent to opaque and are only rarely transparent. If you mark a streak plate with feldspar, the streak will be white. The specific gravity of feldspars vary from 2.5 to 2.8. On Moh's Hardness Scale, the hardness of feldspars vary from 6.0 to 6.5. The lustre of feldspars is usually vitreous but can be pearly on some cleavage faces. Feldspars display perfect cleavage in two directions, usually intersecting at close to 90 degrees. This perfect 90 degree cleavage, together with consistent hardness, specific gravity and pearly luster on the cleavage faces, are the diagnostic characteristics of feldspar.

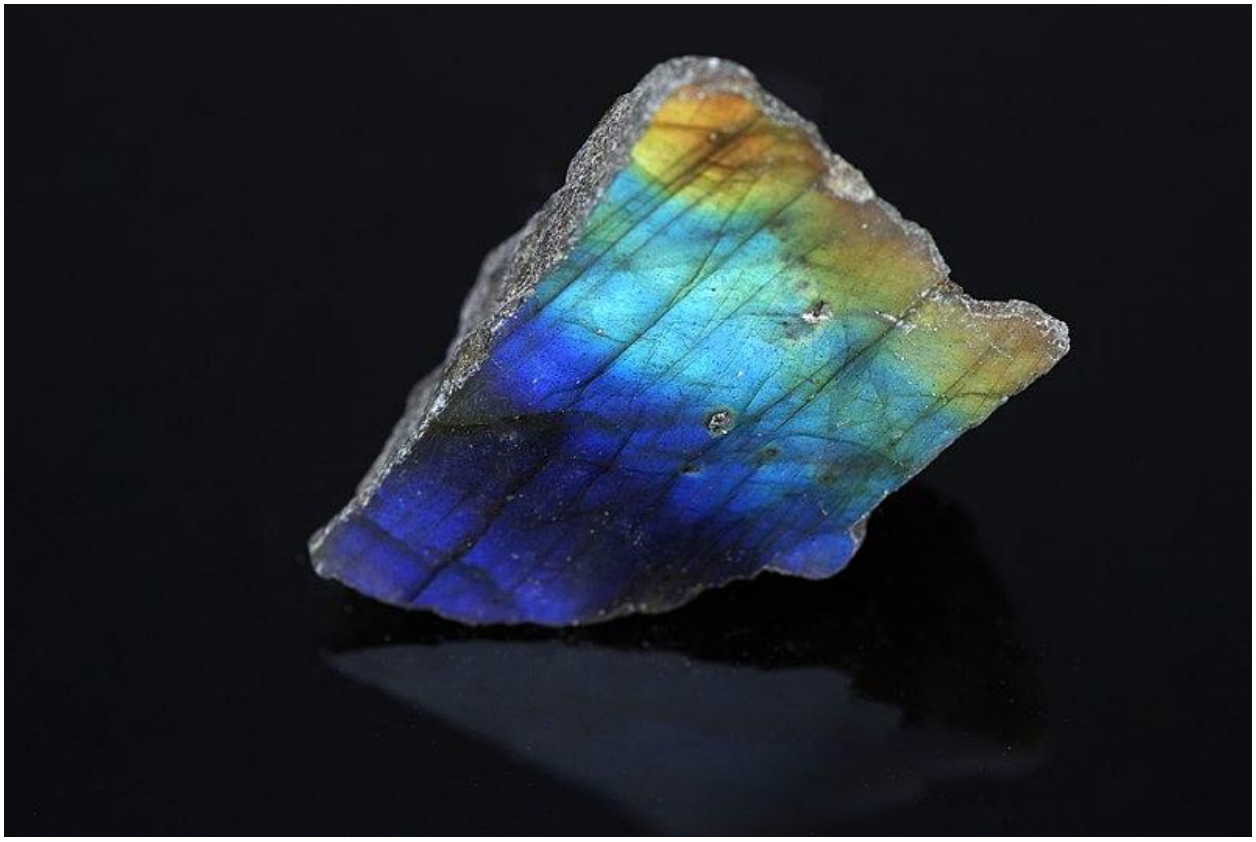

**Figure 3 - Labradorite**
Credit Linas Juozėnas, Wikimedia Commons

Chemically, all feldspars are aluminum silicates with the general formula of **X**$(Al,Si)_4O_8$ where **X** is a cation, usually calcium, potassium, sodium or a combination thereof. Figure 4, is ternary diagram showing the varying chemistry of feldspars.

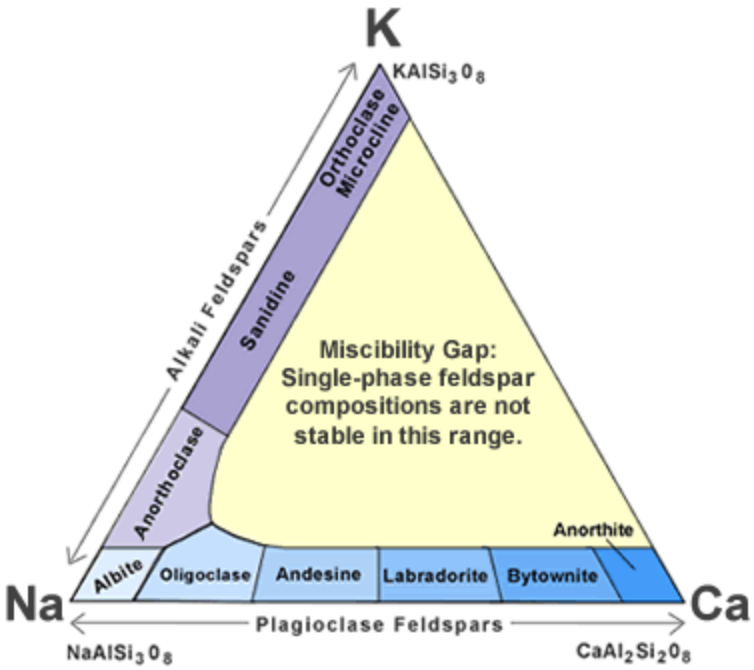


**Figure 4 - Ternary Diagram of Feldspar Chemistry**

As shown in Figure 4, the alkali feldspar series and the plagioclase feldspar series are two solid solution series that intersect at albite.

The plagioclase series ranges from pure sodium feldspar (albite - $NaAlSi_3O_8$) to pure calcium feldspar (anorthite - $CaAl_2Si_2O_8$)  Other minerals in the plagioclase series include oligioclase, andesine, labradorite, and bytownite.  Plagioclase minerals are the most common feldspar.

The alkali feldspars, also called K feldspars or K-spar, are a solid solution series that ranges from pure sodium feldspar (albite - $NaAlSi_3O_8$) to pure potassium feldspar (orthoclase and microcline -$KAlSi_3O_8$).  In between these endpoints are anorthoclase and sanidine.

In some cases, other cations substitute for the calcium, potassium and/or sodium to produce rare minerals; these include:

- Buddingtonite ($(NH4)(AlSi_3)O_8$) an ammonium feldspar;
- Banalsite ($Na_2BaAl_4Si_4O_{16}$) and Celsian ($BaAl_2Si_2O_8$) barium feldspars; and
- Stronalsite ($Na_2SrAl_4Si_4O_{16}$) a strontium feldspar.

**The Uses of Feldspar**

In 2020, 23,000,000 metric tonnes of feldspar were mined worldwide. The primary uses of feldspar are for glass and ceramics.  For example, a growing segment of the market is the use of

feldspar in the production of glass for solar panels. (USGS Mineral Commodity Summaries, Jan. 2021, pp 58-59)

Some feldspars are also used to make jewelry, these include Amazonite, Labradorite, Moonstone, and Sunstone.

**Standard Caveat**

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**In science, the only authority is the evidence!**