

June 7, 2021

Nepheline, Sodalite and other Feldspathoids



Figure 1 - Nepheline

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[Feldspathoids](#) such as nepheline, kalsilite, sodalite and leucite are silicate minerals, similar to feldspars, but with lower silica (SiO_2) content. These minerals form in [alkali magmas](#). Alkaline magmas generally occur on volcanoes associated with oceanic islands and continental rifts. The rocks formed by alkaline magmas are typically chemically undersaturated with respect to silica; hence they will not contain orthopyroxene and quartz but will have feldspathoid minerals such as nepheline. Rocks that form from alkaline magmas range in grain size from fine grained basalts to medium grained syenite to coarse grained pegmatites.

So, let's look a few of these minerals

[Nepheline](#) and [Kalsilite](#)



Figure 2 - Kalsilite

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Nepheline, $\text{Na}_3\text{K}(\text{Al}_4\text{Si}_4\text{O}_{16})$, and kalsilite, KAISiO_4 , are part of a solid solution series of minerals that vary in the amount of sodium and potassium in the crystal. Figure 3 is a ternary diagram that shows the relationship between nepheline, kalsilite, leucite, feldspar and silica. The temperature contours are the crystallization temperatures. "R", in the centre, is the reaction point.

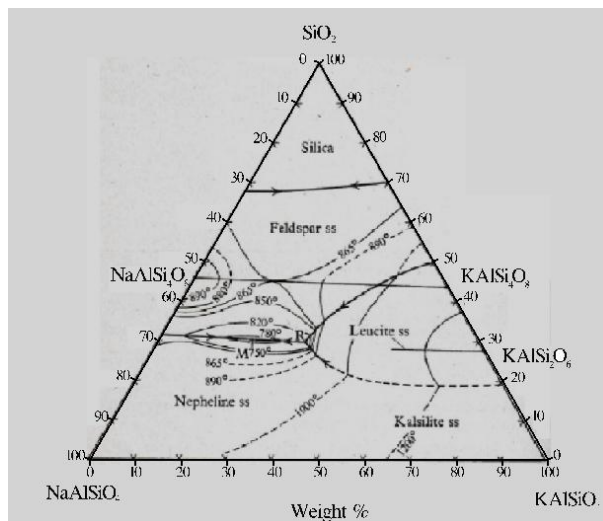


Figure 3 - Ternary Diagram

Adapted from Fig.143 in Deer, W., R. Howie, & J. Zussman, 1966, Introduction to the Rock Forming Minerals, Longman Group. Ltd., London, U.K.

Nepheline is one of the most common feldspathoid minerals; it is white, grey or yellowish in colour, has a vitreous, greasy lustre, a [Moh's hardness](#) of 5½ - 6 and in the [hexagonal crystal system](#). Kalsilite is similar, it is colourless, white or grey in colour, also has a vitreous, greasy lustre, a Moh's hardness of 6 and is also in the hexagonal crystal system. Nepheline is much more common than kalsilite and is found in both volcanic and plutonic rocks whereas kalsilite is only found in some volcanic rocks. One interesting feature of both nepheline and kalsilite is that they form a gel when immersed in strong hydrochloric acid.

As a commodity, nepheline is sold as [nepheline syenite](#) for use in ceramics and glass making. [Major economic deposits of nepheline syenite](#) are in Maine, USA, Baden-Württemberg, Germany and the Kola Peninsula of Russia.

Sodalite



Figure 4 - Sodalite

Credit: [Eurico Zimbres](#), [Creative Commons Attribution-Share Alike 2.5 Generic license](#).

Although it can come in many colours, sodalite, $\text{Na}_4(\text{Si}_3\text{Al}_3)\text{O}_{12}\text{Cl}$, is best known for the specimens that have a striking blue-violet colour. It has a vitreous to greasy lustre, a Moh's hardness of 5½ - 6 and is in the [isometric crystal system](#).

Sodalite occurs in igneous rocks that crystallized from sodium-rich magmas and is most often found in nepheline syenite, [trachyte](#) and [phonolite](#) rocks. It was first identified in rocks from [Greenland](#) but has since been found in [many other localities](#), especially in Ontario, Canada. The most common use for sodalite is as a [gemstone](#).

[Leucite](#)



Figure 5 - Leucite in Volcanic Rock

Credit: [Kelly Nash](#), [Creative Commons Attribution 3.0 Unported](#) license.

Leucite, $K(\text{AlSi}_2\text{O}_6)$, is white and grey in colour, has a vitreous lustre, a Moh's hardness of $5\frac{1}{2}$ - 6 and is in the [tetragonal crystal system](#). Leucite is found in recent volcanic deposits that are rich in potassium. The type locality is [Monte Somma](#), part of the Somma-Vesuvius Complex near Naples, Italy. It is also found in the appropriately named [Leucite Hills](#) north of Rock Springs, Wyoming, USA.

An interesting feature is that leucite crystallises with a cubic crystal structure at high temperature (ca. 900°C) but reverts to a tetragonal crystal structure upon cooling to $700\text{-}600^\circ\text{C}$. Also, over time, it can transform into a crystal called *pseudoleucite* which retains the overall form of the original leucite crystal but is made up of an intergrowth of nepheline and feldspar. This gradual transformation is why it is only found in recent deposits.

Leucite is used as a [gemstone](#), the principle source of which is [Mt. Vesuvius](#). Gem quality specimens are apparently quite rare. It was once used as a fertilizer for its potassium content.

Standard Caveat

The purpose of my weblog postings is to spark people's curiosity in geology. Don't entirely believe me until you've done your own research and checked the evidence. If I have sparked your curiosity in the subject of this posting, follow up with some of the links provided here. If you want to, go out into the field and examine some rocks on your own with the help of a good field guide. Follow the evidence and make up your own mind.

In science, the only authority is the evidence.

Postscript - The Beer Mug



[Core Sample Glass](#)

Credit: Jim Weinpress

Those of you who follow me on LinkedIn might have seen the picture of the beer glass that I posted on that platform. The credit for the picture goes to Jim Weinpress, Curator of Birds and Mammals at [The Virginia Living Museum](#), Newport News, Virginia. I grabbed the picture off of a posting that Jim Weinpress made on a Facebook Group called [Paleontology Coproliteposting](#).

As of 9:00 AM CST, June 7, 2021, there have been 311,563 views of the LinkedIn post showing the picture of the beer glass together with 8,190 reactions and 505 comments. Clearly, this is a good example of a comment that goes viral.

The beer glass is sold by a company called [Cognitive Surplus](#) and the [beer glass is listed here](#).

