MOONSTONES & CO.

A BRIEF REVIEW OF THE FELDSPAR GROUP

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Jewellery of today often takes profit from the beauty of minerals of the feldspar group. As with many mineralogical names they are barely known among jewellery manufacturers and consumers but they may know the gemmy varieties of the group, such as moonstone, amazonite, spectrolite and labradorite. The intention of this article is to present a picture of the feldspar group in respect of its representatives used as gemstones.

Feldspars are among the silicate minerals most frequently found in crystalline rocks such as granite or gneiss. They represent a common crystal structure which can exist with a few variations, or substitutions, depending on the chemical constituents available during crystallisation. Basically there are three different major elements (K, Na, and Ca) which define important feldspar minerals: potassium (orthoclase), sodium (albite) and calcium (anorthite). When mineralogists analysed various feldspars they became aware that common feldspars were rarely pure in composition but either potassium feldspar, with some sodium, or a feldspar of intermediate composition with sodium and calcium. Thus mineralogists group them as 'alkaline feldspars' (K,Na) and so called plagioclases feldspars (Na,Ca). Graphically this situation is often illustrated by a triangular diagram with corners indicating 100% K, Na, and Ca composition. See figure 1. Mixtures between the potassium and calcium end members do not exist. Owing to symmetry details, related to the temperature history of the crystals, a great number of other varieties are known but these are not relevant for gemmologists. Feldspar minerals occur with monoclinic and/or triclinic structure.

With respect to potassium feldspars, with gemstone potential, there is a yellow orthoclase (or sanidine) $KAlSi_3O_8$ from Madagascar which may be encountered as a faceted gemstone. Other potassium feldspars (microcline) are often white or pastel

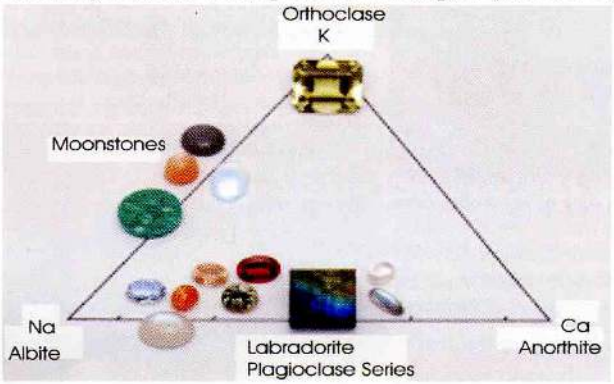

Figure 1

A graphical display of the three extreme feldspar compositions and their naturally occurring intermediate mixtures is shown here.

Moonstones, in different colours, and amazonite are among the potassium feldspars. Sunstone, andesine, labradorite and spectrolite are in the plagioclase series.

shades and occur as moonstones. When white they may show a bluish sheen effect as in the classical moonstone. Other moonstones, especially those from India, are often coloured grey, orange, greenish or pinkish owing to minute coloured guest minerals dispersed in the host. Another effect, seen in some of these moonstones, is the cat's eye, a single shining line running over the cabochon's surface. In less frequent cases two such lines cross, representing a star moonstone. The reason for the moonstone sheen effect is a precipitation of tiny flakes of albite feldspar in the microcline matrix ($KAlSi_3O_8$), arranged along crystal structure directions.

Originally moonstones with only bluish sheen were found in Sri Lanka. More recently there has been a new occurrence of moonstone (peristerite) in Tanzania. Owing to their composition moonstones have an average refractive index of 1.52 and a specific gravity of 2.57, both these values being on the low side compared with other gemstones. The hardness of 6 is at the low end of what is needed for to withstand daily wear conditions. Cleavage may represent a problem when feldspars are knocked: a stone may split with a flat plane rather than a conchoidal fracture.

Another much esteemed K feldspar is blue-green amazonite which, as a non-transparent stone, often contains white seams. It is commonly cut as cabochons or used for bead necklaces. See figure 2, left.

The plagioclase group contains more esteemed gemstones such as sunstone and spectrolite, which range from high Na to high Ca minerals. Mineralogists speak of solid solution between the end members albite (Na) and anorthite (Ca). A number of minerals with intermediate composition are defined. The mid-point of the series is known as labradorite, with RI and SG between the values for albite and anorthite, at 1.56 and 2.70, the Ca component raising the constants considerably from albite to anorthite. The best-known plagioclase feldspar is probably spectrolite, a dark variety of labradorite which often grows in an extremely fine lamellar array giving rise to rainbow colours. These interference colours are perceived best on a dark background. Figure 3 below.

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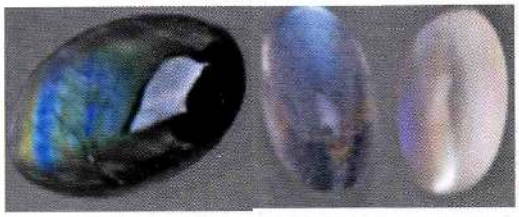
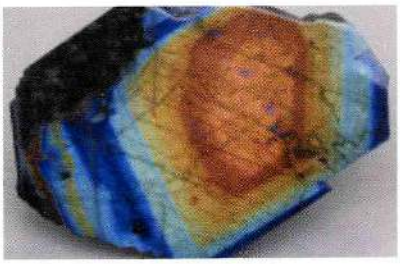


Left: Figure 3 Three labradorites with decreasing amount of black ore minerals. The large cabochon on the left is also called spectrolite because it shows best the spectral colours. Photo © H.A.Hänni



Right: Figure 4 This shows a slice of spectrolite from Finland: a labradorite with interference colours and a large number of tiny black magnetite inclusions, in three directions, which provide the dark background colour against which the interference colours appear at their best. Photo © H.A.Hänni.