

Garnets

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Tuesday, 13 November 2007

Garnets

The garnet is invariably associated with a gem stone of dark red color. Actually, garnets occur in many different shades, and there are at least five varieties. Their chemical compositions are complicated and varied, but all consist of a double silicate in which one of the metals may be calcium, ferrous iron, magnesium, or manganese, and the other, aluminum, ferric iron, or chromium.

Perhaps the best known of all garnets is the pyrope variety, a magnesium aluminum silicate with a composition that can be expressed as $Mg_3Al_2(SiO_4)_3$. An important point to note is that the varieties are not sharply separated, but grade into one another. This means that one type may contain varying amounts of metals of another, so that the chemical composition is never constant. The name pyrope originates from the Greek word *pyr*, meaning fire. This particular garnet was popular in Victorian days, and much jewelry of this period is set almost entirely with deep-red stones.

A similarity to the color of ruby has led to a considerable amount of mis-naming of the pyrope garnet. Pyropes occurring in association with diamonds in South Africa have been called "Cape rubies," while pyrope pebbles from Arizona and New Mexico have been sold locally as "Arizona rubies." Many of these stones are also found in Czechoslovakia, where they are known as Bohemian garnets.

A close relative of the pyrope is the almandine garnet. Here, iron replaces the magnesium in the chemical formula $Fe_3Al_2(SiO_4)_3$. Pyrope and almandine, however, are not sharply defined varieties, and it is quite possible that neither of them can be found in nature in the absolutely pure form. Almandine is a red stone and generally has a purplish tinge. Because of its very dark color, little light is allowed to penetrate. These stones are normally cabochon cut, and, because of their deep color, this is often modified into a rounded shell, called hollow cabochon, so as to present only a thin layer of the stone to the eye. Almandine garnets are chiefly found in the gem gravels of Ceylon and in India, where many of them are cut and marketed. At present, these stones are of limited popularity and are rarely seen in modern jewelry.

The so-called rhodolite garnet has the rose-red color of certain rhododendrons. It belongs to the pyrope-almandine intermediate series of garnets. Rhodolite garnets have been found in North Carolina, but stones of similar color have also been discovered in the Ceylon gem gravels and Tanzania.

Another type is the grossularite garnet, of which the hessonite is a variety. Both are calcium aluminum silicates, $Ca_3Al_2(SiO_4)_3$ with the metals iron and manganese sometimes partly replacing the calcium. Hessonite garnet is the color of golden syrup and is mainly found as pebbles in the gem gravels of Ceylon. Grossularite garnet occurs in massive green chunks, and is found in South Africa where it is known as "Transvaal jade."

Then there is the demantoid garnet, a variety of andradite, and a gem stone of exceptional beauty. Chemically, it is a calcium iron silicate, $Ca_3Fe_2(SiO_4)_3$. The best stones are of fine, grass-green color. Cut as gems, they equal the diamond in their brilliance, but their fire is not so well seen, being hidden by the green color of the stone. Demantoids are known to occur only in the Ural Mountains, and, unfortunately, this source seems now to be exhausted.

Like the diamond, all garnets belong to the cubic crystal system. Most of them possess a hardness of about 7.5, an exception being demantoid, with 6.5. Apart from their uses in jewelry, garnets are employed as an abrasive, primarily for the polishing of wood.