14.5: Synthetic Forsterite

Although forsterite does occur in nature, it is not suitable to be cut into gemstones. As from 1999 large size synthetic forsterites have been created in Russia by the Czochralski pulling technique. Due to physical and optical properties that lie close to tanzanite, this synthetic is used mainly to imitate tanzanite.

\[ \text{Mg}_2\text{SiO}_4, \text{magnesium silicate.} \]

Forsterite is one of the end members of the isomorphous group to which peridot (olivine) belongs (fayalite-forsterite series).

One of the easiest and most important techniques in separation synthetic forsterite from tanzanite is by observing the "doubling of back facet edges" (double refraction) due to the high birefringence of synthetic forsterite. This feature is easily visible on examination in various directions using a loupe. Tanzanite with a birefringence of 0.008 to 0.013 will not show such a strong doubling effect.

Hanneman Tanzanite Filter

Another quick method to separate synthetic forsterite from tanzanite is with the aid of a Hanneman Tanzanite Filter. This is a filter that combines the Hanneman Aquamarine filter with a London dichroscope. Synthetic forsterite will show up green through the filter part, while tanzanite will show a pinkish-orange color.
**Refractometer**

The refractive indices of synthetic forsterite are lower than that of tanzanite.
1.634-1.670 (tanzanite: 1.685-1.707).

Forsterite's birefringence is much higher than that of tanzanite: 0.033 - 0.038 for forsterite, 0.008 - 0.013 for tanzanite.

The optic character of pure forsterite is biaxial with a positive optic sign (the same as tanzanite). One will sometimes read forsterite to be biaxial -, however, if olivine consists of 100 to 85% forsterite (0 to 15% fayalite) it is biaxial +.

In practice, synthetic forsterite will be biaxial with a positive optic sign.

**Fluorescence**

Synthetic forsterite will show a weak greenish-yellow under SW-UV and a chalky orangy-yellow under LW-UV. Tanzanite is inert to both.

Natural colorless forsterite has been found in Mogok, Burma (Myanmar) as of early 2008. Originally thought to be a member of the humite group, testing at the GIT and the GIA Laboratory in Bangkok confirmed that the stones were forsterite.

- Introduction to Optical Mineralogy 3rd edition (2003), Prof. W.D. Nesse
- Manufacturers data of synthetic forsterite - Provided by Morion Company