

# **GEMSTONE TREATMENT AND ENHANCEMENT METHODS**

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The term **enhancement** is defined as any treatment or process other than cutting and polishing that improves the appearance (color/clarity/phenomena), durability, value or availability of a gemstone. In today's gem marketplace, many gemstones have been enhanced by a variety of methods. Such processes may range from simple heating (such as with tanzanite) to high-tech irradiation (such as blue topaz).

# Heating

To heat most kinds of colored gemstones is a standard procedure between mining and cutting of the gem. It became more and more sophisticated as the knowledge about it was passed over from generation to generation. Methods vary from simply burning the rough minerals in an open fire to highly elaborate techniques under regulated temperatures.

# Why are gemstones heated?

The rough gems are heated to improve their quality. Through burning, as the heating is also called, hues become stronger, colors are revealed or even changed by the process, inclusions become less prominent or vanish at all, and the durability of the stone is improving. For example, if a darkish Tourmaline is heated, its color will brighten. Heating can lead to astonishing outcomes, and otherwise unimposing minerals are turned into beautiful sparkling treasures. In today markets, you will find that Aquamarine, Amethyst, Citrine, Kunzite, Tanzanite, Topaz, Tourmaline, Zircon as well as Ruby and Sapphire are enhanced with heat in most cases.

# Does heating effect the price of a gemstone?

The good quality gemstones are by far less common than comparable enhanced ones, and this can be reflected in the price. Unheated Red Ruby and unheated Blue Sapphire are in permanent demand, and those natural wonders are traded with a premium. Top quality unheated Red Ruby and Blue Sapphire are absolutely rare, hard to find even in the world's most famous deposits and therefore extremely expensive. On the other hand, many kinds of gemstones would not exist without heat treatment, e.g. tanzanite or prasiolith

# Heating

The treatment is permanent and accepted within the gem community. Heating does not change the chemical structure of the gem

# Beryllium Heating

Beryllium heating is most commonly used to reveal yellow and orange colors in sapphires. Sapphire is often found in gem gravels together with Spinel, Tourmaline and Chrysoberyl. Latter has an influence to the color of the Sapphires if heated together: To sort out the different specimen before the traditional burning process is sometimes too difficult. Heated together, the Chrysoberyl ( $\text{BeAl}_2\text{O}_4$ ) volatilizes very little quantities of Beryllium (Be). This is probably a catalyst causing a thermo-chemical reaction in the Corundum's atomic structure. Once this coherence was found, it was made a point to produce Yellow and Orange Sapphire. The exact coloring process in this reaction is still unknown. The method is relatively new, hence it is also frequently called “new heating” or “heat treatment with additives”. Beryllium heating cannot be detected by standard gemological analyzing methods, only by two sophisticated and expensive tests which both are destructive.

# Oiling

This method has been used for more than 600 years, mostly on fissured and porous gemstones - especially Emerald. This treatment reduces brittle fractures and may provide a better clarity. Besides colorless oils various fillers are used, e.g. wax and natural or synthetic resins. Oiling is not a permanent treatment and in some cases requires reapplication every few years, but it is generally accepted. Special care should be exercised when mounting, repairing and cleaning oiled gems. Under no circumstances oil-dissolving chemicals should be used for cleaning

# Diffusion

Diffusion or “surface diffusion” is an enhancement method in which certain elements such as iron and titanium are added during the heating of the gemstone. Commonly used on Corundum, the added elements create a diffusion layer. This layer can be a colored coating or contain asterism producing inclusions, or both. This treatment is quite stable, but surface Diffused Star Sapphires or Diffused Sapphires should be handled with special care because the effect bearing subsurface is only about 0.1mm in depth. A diffused gem may lose its beauty if scratched, polished, re-cut, or otherwise damaged.

# Irradiation

Hidden in the depth of Earth for millions of years, gems are undergone to natural radiation that can impinge on the colors or clarity of gemstones. If exposed to artificial gamma or electron irradiation, this effect can be used to enhance the gems. Within hours, a gemstone's color can be altered and the clarity improved. Irradiated gems do not require special care and the treatment is considered permanent, but the colors may fade with time or regress towards its previous hue in some cases (Yellow Beryl, Kunzite, Blue Topaz).

# Doublet and Triplet

## Doublet

Two pieces of gem material, fused together by heat or cemented with a very thin layer of colorless glue.

## Triplet

A colored layer of cement joins two colorless pieces of gem material, or three pieces of gem material are joined with colorless and black cement (opal triplets).

# FRACTURE FILLING

The next category is the filling of surface-reaching fractures, cleavages, laser drill holes, and other voids with glass, plastic, or other substances. This category includes the treatment often referred to as "oiling" of emerald in the trade. Emerald and diamond are the two gem materials that in our experience are most often treated in this manner, although we have encountered other gems that have been so treated, including tourmaline, amethyst, garnets, and tanzanite.