

# Testing Times

**Quantum leaps in technology and the huge amount of research carried out both on the scientific and commercial level have created a new generation of synthetic diamonds which are also much more challenging to detect. These new generation synthetic diamonds also do not conform to the typical synthetic diamond properties which were routinely seen in most synthetic stones.**

In recent years the technology used to create gem quality synthetic diamonds has been advancing exponentially. A laboratory- created or synthetic diamond is defined as a stone with the same chemical, physical and optical properties as a mined diamond. As far as aesthetics go, it is impossible for consumers to discern any differences between a naturally formed diamond and a synthetic diamond, either by the naked eye, or with a 10x magnification loupe.

Both natural and synthetic diamonds are composed of the same basic building blocks – nearly pure carbon (C), and the crystalline structure is very similar. Differences can only be detected using specialized instruments. In nature, diamonds are formed at a depth of 150 - 300 kilometers below the earth's surface, in the upper mantle. They are created in conditions of intense temperatures (1,500-1,800° C) and enormous pressure (45-60 kbar) and they are carried to the surface by volcanic activity. In contrast, modern synthetic diamonds are produced in a laboratory by one of two methods – either by HPHT (High Pressure High Temperature) or CVD (Chemical Vapor Deposition). Both these processes can produce a diamond within days, rather than the millions of years it takes Mother Nature to make a diamond.

The introduction of synthetic diamonds into the

global markets should not pose a threat to the demand for natural diamonds, as most industry experts point out that consumers will always pay a premium for a natural gemstone when compared to their synthetic counterparts which can be grown in a laboratory. Furthermore the introduction of synthetic color stones many decades ago has only boosted consumer's interest for natural color stones, therefore, demand for Natural Diamonds should not be affected as long as there is full disclosure of their synthetic counterparts.

As consumers and retailers are generally unable to distinguish a synthetic diamond from a mined diamond, detection can only be handled by laboratories operating highly specialized and sophisticated equipment. In the past, it was relatively straight forward for a gemological laboratory to detect synthetic diamonds as there were very few techniques to synthesize diamonds. These techniques involved fixed temperatures, pressure and raw material variables, resulting in synthetic diamonds with very little optical and physical variations in their properties.

These synthetic diamonds were generally in the lower color ranges and the fancy colors



Figure 1: Synthetic yellow diamond (1.03ct) attracted to a magnet due to magnetic inclusion

often appeared very artificial and were easily distinguishable from their natural counterparts, even with the naked eye (Fig.1). The current range of synthetics being produced, however, may range from colorless to fancy color, and look identical to the colors produced by nature.

Thus earlier lab created, synthetic diamonds were detected by their characteristic

inclusions (Fig.2); for example typical pinpoint inclusions (distinct particles within the diamond),



Figure 2: Rod shaped metallic inclusion

magnetic inclusions and/or the typical crystal growth patterns. Another method routinely used to identify synthetic diamonds was their UV fluorescence signature. However, with the invention of new technologies and cutting styles some of these features have been eliminated.

Earlier synthetic diamonds used to show a distinct

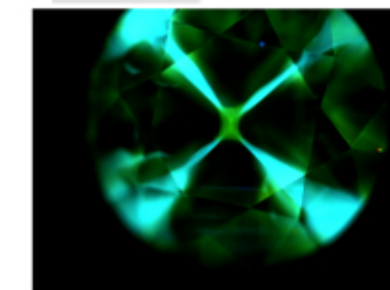


Figure 3: Typical cross pattern observed under SW-UV fluorescence

“cross” (Fig.3) and/or “hour glass” pattern; these distinctive growth patterns gave away their synthetic origins. Due to

continuously improving production techniques, these patterns have become less common and sometimes no pattern is detectable at all.

Breakthrough in scientific technology and significant investments in research have created a new generation of synthetic diamonds. On

spectroscopic analysis many distinct bands and peaks which were earlier evident only on the spectral graphs of natural stones are being induced in synthetic diamonds using radiation, heat treatments and other raw materials to make them similar to their natural counterpart.

This new generation of synthetic diamonds tends to include larger sizes, and comes in better clarity and color grades than their predecessors. They are also much more challenging to detect.

Notwithstanding these technological advances, International Gemological Institute (IGI) plays a crucial role on behalf of the diamond industry to stay on top of gemological issues with its highly sensitive and sophisticated gemological equipments monitored by a team of experienced gemologists to detect the advanced synthetic creations currently floating in the diamond market. Therefore, gem testing laboratories play an important part in the industry ensuring that the interests of the end consumers are protected and that the integrity of the diamond market as a whole is safeguarded.

## International Gemological Institute (IGI)

The International Gemological Institute, the world's largest independent laboratory for testing and evaluating gemstones and fine jewelry, was established in 1975 in Antwerp and is located in New York City, Los Angeles, Toronto, Hong Kong, Mumbai, the Seepz Zone, Kolkata, New Delhi, Tel Aviv, Dubai, Bangkok, Tokyo, Thrissur, Surat, Chennai, Ahmedabad. IGI is an ISO accredited worldwide organization. Over 5 million gems & jewels bearing the IGI report have been traded in more than 120 countries. For additional information, please visit [www.igiworldwide.com](http://www.igiworldwide.com).

