

DIAMONDS – NATURAL and MANUFACTURED

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Natural Diamond

Roughly 49% of the natural diamonds originate from central and southern Africa, although significant sources of the mineral have been discovered in Canada, India, Russia, Brazil and Australia. Diamond crystals are brought to the surface through volcanic pipes from deep in the Earth where the high pressure and temperature enables the formation of the crystals.

Diamond Formation

Diamonds are formed by long exposure of carbon-bearing materials to high pressure at relatively low temperature. Natural diamonds usually come from many miles below the Earth surface. Beneath the thick continental crust, diamonds form starting at depths of about 150 kilometers (90 miles), where the pressure is high and the temperature is around 1200° C (2200° F).

Surfacing

Diamond-bearing rock is brought close to the surface by volcanic eruptions and come to the surface through volcanic pipes. The pipes contain material that was transported toward the surface by volcanic action, but was not ejected before the volcanic activity ceased. Diamond-bearing volcanic pipes are closely related to the oldest, coolest regions of the Earth's crust. Not all pipes contain diamonds, and even fewer contain enough diamonds to make mining economically viable.

Value as Jewelry

The most familiar usage of diamonds today is as gemstones that dates back into early history and references to diamond were found in a Buddhist text around 296 BC. Diamonds are thought to have been first recognized and mined in India where deposits of the stone carrying diamond was found. Diamonds quickly became associated with divinity, being used to decorate religious icons, and were believed to bring good fortune to those who carried them. Early recorded use of them was as eyes in Hindu devotional statues. Today, diamonds are used to symbolize eternity and love and used for engagement and wedding rings.

Famous Diamonds

The Cullinan Diamond, part of the British Crown Jewels, was the largest gem-quality rough diamond ever found (1905), at 3,106.75 carats. One of the diamonds cut from it, Cullinan I

or the Great Star of Africa, was formerly the largest gem-quality cut diamond at 530.2 carats, but now that title has been taken by the Golden Jubilee (1985), a 545.67 carat, yellow-brown diamond. The largest flawless and colorless (grade D) diamond is the Centenary Diamond that weighs 273.85 carats. The Millennium Star is the second largest (1990) at 203.04 carats.

Manufactured Diamond Beginnings

It's always easy to look back over a span of time and cite the wisdom of those efforts which proved successful. Surely there were important people who considered GE's early commitment to attempt to make diamond to be a foolish waste of talent and money, especially in light of the many scientists who had tried previously and could not produce diamond. These people wisely recorded their attempts to manufacture diamonds so that others who would follow knew what did not work.

Diamond Facts

Diamond is pure 100% carbon that is formed over many thousands of years in the earth while under tremendous pressure and heat. These were the conditions the team felt must be achieved if they had any chance of success. And it's no wonder that the nine men on the GE team would achieve what no one had before. More than a dozen eminent scientific figures had already tried to make diamond and had not succeeded.

Success at Last

It was thought they must be able to achieve and maintain temperatures above 3500°F at pressures near one million pounds per square inch, roughly the earth's pressure at a depth of 150 miles. By 1953 GE had developed devices that could provide these conditions, but it was not enough, the carbon would not convert to diamond. The scientists pondered for days, weeks, months and experiment followed experiment. No matter how they changed the variables, the carbon containing substances just would not convert to diamond. Then, when it all seemed so fruitless, came the breakthrough, effective catalysts were found that mixed with the pure carbon provided the missing link.

For the first time Man-Made* diamond crystals were created, a genuine scientific breakthrough. On February 15, 1955, press representatives were invited to view some grayish green and yellow crystals under a microscope and wonder at GE's contention that these unspectacular little pieces of material represented a very spectacular scientific achievement. Any scientific breakthrough is built on a foundation of what has gone before. It is useful to know what has not

worked. In this sense all these attempts provided some positive contribution to GE's manufacture of diamond.

Polycrystalline Diamond (PCD) Tools

PCD tools consist of fine manufactured diamond crystals sintered and fused to a carbide base. These tools are used to machine and grind hard abrasive non-ferrous and non-metallic materials, such as stone, silicon aluminum, ceramics, etc., at high speed. They have excellent wear and shock resistance and provide 100 times greater tool life than carbide tools.