



NATURE

Diamonds have been known as the hardest of all materials since the earliest record of their existence. The word, Diamond, is derived from the Greek word *Adamao*, meaning 'I tame' or 'I subdue'. The adjective, *Adamas*, meaning 'unconquerable', was used by the ancient Greeks, almost 2,000 years ago, to describe the hardest or most impenetrable substance.

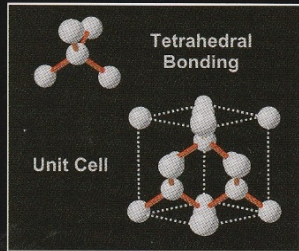
PROPERTIES

<i>Composition</i>	Carbon
<i>Crystal System</i>	Cubic
<i>Crystal Forms</i>	Various
<i>Hardness</i>	10
<i>Specific Gravity</i>	3.51
<i>Refractive Index</i>	2.417
<i>Dispersion</i>	0.044
<i>Lustre</i>	Adamantine

Diamond is a crystalline mineral, consisting of Carbon in its most pure form. Its unique, 'single-element' composition and dense, powerfully-bonded molecular structure, give rise to its supremely outstanding physical and optical properties.

Not only is diamond the hardest material known to exist, it also possesses the highest Refractive Index, Dispersion and Lustre (reflectivity) of all natural gemstones. Its rare combination of durability and brilliance make it one of the most prized of all of nature's treasures.

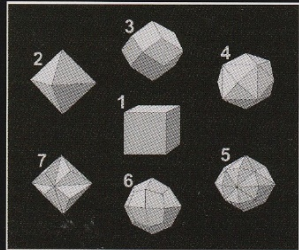
STRUCTURE



Diamond is composed of a rigid lattice of carbon molecules in which each carbon atom is bonded with 4 of its neighbours in an equally spaced, 4-directional (tetrahedral) arrangement.

Diamond crystals are made up of repeating structural units, known as 'unit cells', each containing the same number of carbon atoms, arranged, essentially, in the form of a Cube. The symmetry of the unit cell and the bonding habit of the carbon atoms, allow Diamond crystals to form in a wide variety of different shapes.

CRYSTAL SHAPE



Diamond crystals can assume any of the seven basic forms of the Cubic Crystal System, these being 1. Cube, 2. Octahedron, 3. Dodecahedron, 4. Tetrahexahedron, 5. Hexoctahedron, 6. Trapezohedron and 7. Trisoctahedron. They can also assume various combinations of these, by 'intergrowth' or 'twinning' to create over 20 other unique crystal shapes.

The most commonly encountered shapes are those of the well known Octahedron, the Dodecahedron, the Cube and triangle shaped, 'twinned' crystals known generally as Macles.

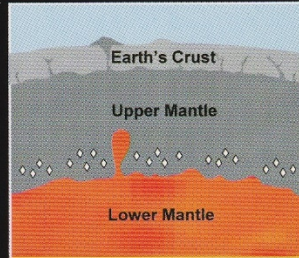
ORIGIN

Diamonds are created deep within the Earth and later brought to the surface by a unique series of geological events. The process, which first began when the earth was young and the rocks forming the continents of the world were still cooling, spans hundreds of millions of years and involves three separate stages of Growth, Emplacement and Exposure.

GROWTH

Diamonds form as crystals, under conditions of extreme heat and pressure, during the slow cooling of molten, carbon-rich rock. They grow and then remain, preserved in the original host rock, far from man's reach, in a narrow zone situated between 150 and 200 kilometres beneath the surface of the Earth's Crust, in the lower regions of the Upper Mantle.

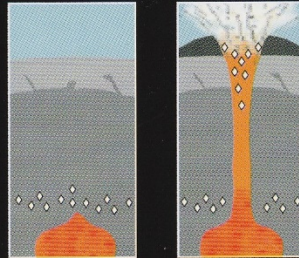
While this process still continues today, it is known that most diamonds were formed between 1 and 3.5 billion years ago, when the required growth conditions were most prevalent.



EMPLACEMENT

Diamonds are emplaced, at a later stage, by volcanic action, when magma, rising from the lower mantle, melts through a region of diamond-bearing rock and carries it upwards.

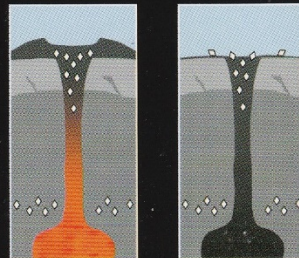
In certain rare events, when highly volatile magmas, such as Kimberlite and Lamproite are involved, volcanic activity can sometimes take place with such intensity and speed that diamonds are carried upwards far and quickly enough to be emplaced, intact, at or near the Earth's surface, within the upper part or 'throat' of an erupting volcano.



EXPOSURE

After a volcano has ceased its activity and cooled, its upper part is progressively worn away by the natural forces of weathering and erosion. Eventually, after many millions of years, the emplaced diamonds are exposed at the Earth's surface, there to await discovery.

Most diamond-bearing volcanos are composed of 'Kimberlite' and are referred to as 'pipes' due to their narrow, cylindrical shape. The oldest known diamond pipes date back 1.5 billion years. The most recent occurred 50 to 100 million years ago.



MINING

Diamonds are mined either at the site of their original emplacement, in exposed kimberlite pipes (primary, 'hard-rock' deposits), or at distant locations, such as river beds and coastal areas, where they have been transported and concentrated by the action of water (secondary, 'alluvial' and 'marine' deposits). Mining methods are determined by the type of deposit.

PRIMARY DEPOSITS



Primary deposits are mined according to the location, size and shape of the remaining volcanic pipe. Typically, in the initial phase of a 'pipe' mine, the diamond-bearing ore (kimberlite) is extracted by open pit mining. Once the depth of the pit reaches a critical level, mining is usually continued underground.

Diamond pipe mines are large-scale operations, requiring up to 25 tons of rock to be extracted and processed in order to recover just 1 carat of Diamonds. This type of mining accounts for approximately 70% of the world's production of diamonds.

ALLUVIAL DEPOSITS



Alluvial deposits are located in the gravels of river beds and terraces and in beach sands. Mining methods vary depending on the type and location of the deposit. Operations range from small, independent, hand-dug claims to much larger concerns involving the use of dredges and other mechanical equipment.

Although smaller, these deposits are often much richer than primary deposits, due the accumulation and concentration of diamonds over millions of years. This type of mining accounts for approximately 30 % of the world's production of diamonds.

MARINE DEPOSITS



The mining of marine deposits is a relatively recent type of operation involving the extraction of diamond-bearing soil from the seabed, outwith existing beach deposits. Methods include in-shore dredging and off-shore mining of the sea-bed using special, purpose-built factory-ships.

The quantity of diamonds produced from these deposits is very small (less than 1%). However the quality is very high (over 90% gem grade), due to the fact that only the purest crystals have survived the long journey from their original source.