Diamond Encyclopedia Article

Diamond

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Substances that exist in two or more forms that are significantly different in physical or chemical properties are called allotropes. Diamond is one of the three allotropic forms of **carbon**; the other two are amorphous carbon and **graphite** (Buckminsterfullerene may be recognized by some as a fourth allotropic form). Unlike many other elements, carbon does not readily convert to different allotropic forms in the absence of extreme conditions, e.g., high pressure, high **temperature**, and/or long times. Besides diamonds, other forms of carbon found in nature include **charcoal**, **coal**, and soot. Synthetic diamonds are produced by forcing an allotropic transition from graphite to diamond under conditions of extremely high temperature and mechanical pressure over a period of several days or weeks.

The French chemist Antoine Lavoisier showed in the eighteenth century that, when air is present, diamonds are combustible, producing **carbon dioxide**. Sir Humphrey Davy demonstrated in 1814 that the sole product of the **combustion** of diamonds in **oxygen** is carbon dioxide. He also proved that diamond and charcoal both consist of carbon atoms, so are chemically identical. This was the first demonstration that two materials with the same chemical composition need not have the same physical properties.

The beauty of diamonds are due to their high refractive indices and their ability to disperse the colors of ordinary light. Diamonds have cleavage planes in four directions, making them highly susceptible to shattering when struck by a hard blow. The hardness of diamond is due to its symmetrical structure. Each carbon **atom** is surrounded by four others in a tetrahedral arrangement; as a result, each diamond is a single **molecule**.

The word diamond comes from the Greek word *adamas*, meaning invincible. Diamonds were first found in the sands of India. Alexander the Great (356- 323 B.C.) introduced them to Europe in 327 B.C.