

Definition: **explosive** from *Philip's Encyclopedia*

Substances that react rapidly and violently, emitting heat, light, sound, and shock waves. Chemical explosives are mostly highly nitrated compounds or mixtures that are unstable and decompose violently with the evolution of much gas. Nuclear explosives are radioactive metals, the atoms of which can undergo nuclear fission or fusion to release radiant energy and devastating shock waves.

Summary Article: **explosive**

From *The Columbia Encyclopedia*

substance that undergoes decomposition or combustion with great rapidity, evolving much heat and producing a large volume of gas. The reaction products fill a much greater volume than that occupied by the original material and exert an enormous pressure, which can be used for blasting and for propelling.

Classification of Explosives

Chemical explosives can be classified as low or high explosives. Low (or deflagrating) explosives are used primarily for propelling; they are mixtures of readily combustible substances (e.g., gunpowder) that when set off (by ignition) undergo rapid combustion. High (or detonating) explosives (e.g., TNT) are used mainly for shattering; they are unstable molecules that can undergo explosive decomposition without any external source of oxygen and in which the chemical reaction produces rapid shock waves. Important explosives include trinitrotoluene (TNT), dynamite, nitrocellulose, nitroglycerin, and picric acid. Cyclonite (RDX) was an important explosive in World War II. Ammonium nitrate is of major importance in blasting.

Applications of Explosives

The major use of explosives has been in warfare. High explosives have been used in bombs, explosive shells, torpedoes, and missile warheads. Nondetonating explosives, e.g., gunpowder and the smokeless powders, have found extensive use as propellants for bullets and artillery shells.

The most important peaceful use of detonating explosives is to break rocks in mining. A hole is drilled in the rock and filled with any of a variety of high explosives; the high explosive is then detonated, either electrically or with a special high-explosive cord. Special explosives, called permissible explosives, must be used in coal mines. These explosives produce little or no flame and explode at low temperatures to prevent secondary explosions of mine gases (see damp) and dust. One important explosive used in mining, called ANFO, is a mixture of ammonium nitrate and fuel oil. Its use has revolutionized certain aspects of open-pit and underground mining because of its low cost and relative safety.

Development of Nondetonating Explosives

Until the 19th cent. gunpowder was widely used in most types of firearms. The invention of various smokeless powders led to the ultimate replacement of gunpowder as a propellant in rifles and guns. Probably the first successful smokeless powder was made by Edward Schultze, a Prussian artillery captain, c.1864. After 1870 it was known as Schultze powder. Its rate of burning was less than that of guncotton because of the partial gelatinization of the powder by a mixture of ether and alcohol; however, it still burned too rapidly for use in rifles. Schultze powder is used in shotguns, blank

cartridges, and hand grenades and in igniting the dense, propellant powder used in artillery. The main constituent of Schultze powder is nitrocellulose.

About 1885 a smokeless powder suitable for rifled guns appeared. Invented by Paul Vieille, it was called *poudre B* and was made from nitrocotton and ether-alcohol. Subsequently, Alfred Nobel added to the growing list of smokeless powders a substance called Ballistite. In Ballistite two of the most powerful explosives known at the time were united; it is made from nitrocotton (with a low nitrogen content) gelatinized by nitroglycerin. Another smokeless powder, cordite, was invented by Sir Frederick Augustus Abel and Sir James Dewar in 1889; it contained a highly nitrated guncotton and nitroglycerin blended by means of acetone. Mineral jelly was added to act as a lubricant. Indurite, invented by Charles E. Monroe in 1891, is made from guncotton and is colloided with nitrobenzine; washing with methyl alcohol frees the lower nitrates from the guncotton.

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