

Explosives

EXPLOSIVES:

An explosive is "a substance or a mixture, which when subjected to thermal or mechanical shock, gets very rapidly oxidised exothermically into products of greatly increased volume, with a sudden release of potential energy."

Since the explosive reaction is exothermic, so the products get heated and a high pressure is exerted on the surrounding. When this extremely rapid chemical change takes place in a confined space, **an extremely high-pressure is developed**, which shatters (चकनाचुर) the confining.

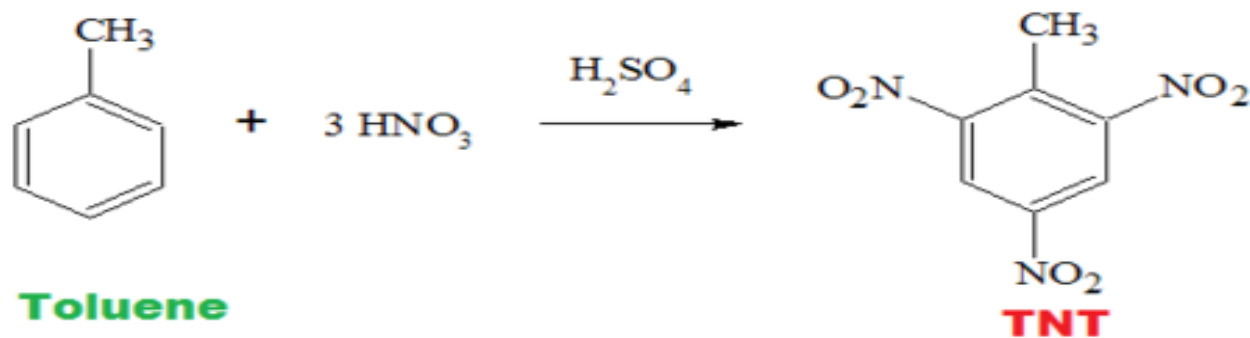
Introduction, preparation, properties and applications of TNT

Introduction:

TNT, short for trinitrotoluene, is a highly explosive organic compound that belongs to the class of nitroaromatic compounds. It is one of the most commonly used explosives in various industries, including mining, construction, military, and demolition. TNT is known for its stability, ease of production, and high energy content, making it a valuable and versatile explosive material.

Preparation:

TNT is synthesized through a chemical reaction involving toluene, nitric acid in presence of sulphuric acid. The reaction is typically carried out under controlled conditions, including specific temperature and pressure, to ensure the desired product formation. The resulting compound is a yellow crystalline solid that is insoluble in water but soluble in organic solvents.



Properties:

1. **Stability:** TNT exhibits good stability, allowing it to be stored and transported without significant deterioration in its explosive properties over time.
2. **Explosive Power:** TNT is a high-energy explosive with a detonation velocity of approximately 6,900 meters per second. It releases a large amount of energy upon detonation.
3. **Insensitivity:** TNT is relatively insensitive to shock, impact, and friction compared to other explosives. This property makes it safer to handle and transport.
4. **Melting Point:** TNT has a melting point of around 80.35 degrees Celsius (176.63 degrees Fahrenheit).
5. **Chemical Composition:** Chemically, TNT is composed of a benzene ring substituted with three nitro (NO₂) groups and a methyl (CH₃) group.

Applications:

1. **Military:** TNT has been widely used in military applications, such as manufacturing explosives for artillery shells, bombs, and landmines. Its stability, power, and insensitivity make it suitable for these purposes.
2. **Demolition and Construction:** TNT is employed in controlled demolition operations to bring down buildings, bridges, and other structures. It helps in effectively breaking down the materials by generating high-pressure shockwaves.
3. **Mining:** TNT is utilized in the mining industry for tasks like rock fragmentation and ore extraction. It helps in creating controlled explosions to break down large rock masses.
4. **Pyrotechnics:** TNT is a key ingredient in fireworks and other pyrotechnic displays. Its explosive properties contribute to the colourful and vibrant effects produced during celebrations and events.
5. **Industrial Applications:** TNT finds use in various industrial processes, including oil well perforation, seismic exploration, and underwater blasting.

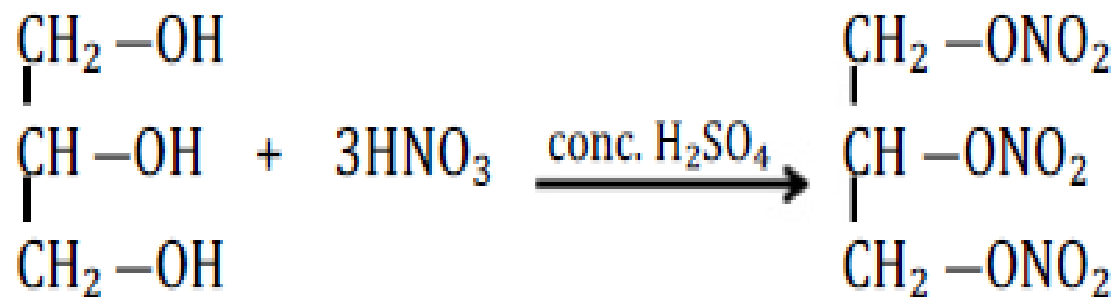
Introduction, preparation, properties and applications of TNG

Introduction:

Trinitroglycerine (TNG) is a highly explosive and sensitive liquid compound. It is commonly used as a primary ingredient in explosives and as a vasodilator (Vasodilators are medications that open (dilate) blood vessels) in medicine. Nitroglycerine was first discovered in the mid-19th century and has since played a crucial role in various industries.

Preparation:

It is synthesized through the reaction of glycerol (also known as glycerin) with a mixture of concentrated nitric and sulfuric acids. This process, known as nitration, involves carefully controlled conditions to prevent unintended detonation. The resulting compound is a colourless or pale yellow liquid that is highly sensitive to shock, heat, and friction.



Properties:

1. **Explosive Power:** It is a highly powerful explosive, releasing a large amount of energy upon detonation. It has a detonation velocity of around 7,000 meters per second.
2. **Sensitivity:** It is extremely sensitive to heat, shock, and friction. It can detonate even with slight stimuli, making it highly dangerous to handle without proper precautions.
3. **Viscosity:** It is a thick and oily liquid with a high viscosity. This property allows it to be easily poured, making it suitable for filling various explosive devices.
4. **Stability:** It is chemically unstable, and it tends to degrade over time. It can undergo spontaneous decomposition under certain conditions, leading to a potential risk of explosion.
5. **Medical Use:** It is utilized in medicine as a vasodilator. It helps relax and widen blood vessels, relieving conditions like angina (chest pain) and reducing blood pressure.

Applications:

1. **Explosives:** It is a key ingredient in many explosives, including dynamite. It is used in mining, quarrying, and construction industries for tasks like blasting rocks, excavating tunnels, and demolishing structures.
2. **Medicine:** It is used in the pharmaceutical industry to produce medications for treating angina and certain heart conditions. It is commonly administered in the form of sublingual tablets, sprays, or transdermal patches.
3. **Propellants:** It is sometimes employed as a propellant in rocket engines and as a boosting agent in certain ammunition.
4. **Industrial Applications:** It is used in various industrial processes, including oil well stimulation, where it is injected into wells to increase oil and gas production.
5. **Experimental Research:** It is used in scientific research and laboratory experiments, particularly in the field of chemistry and explosive engineering.