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Pyrotechnic Accelerants

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Conventional accelerants used in arson crimes, such as gasoline, readily burn in air producing flame temperatures of about 3000 °F. Yet these accelerants generally lack the ability to produce major involvements in short times. This is because, like most combustion reactions, they must rely on a continuing supply of air to provide the needed oxygen. Thus, even when there is a large amount of accelerant, it is of little value unless there is a corresponding large supply of fresh air.

One special class of combustion reactions, "pyrotechnic" reactions, proceeds without having to draw oxygen from the air. This is because pyrotechnic materials are mixtures containing both oxidizer and fuel. Generally the oxidizer is an inorganic oxygen-rich chemical, such as potassium nitrate or ammonium perchlorate. Perhaps the most familiar pyrotechnic reaction is the striking (ignition) of a safety match, whose pyrotechnic composition burns to produce a flame temperature of about 4000 °F. With the addition of high-energy fuels, such as powdered metals, flame temperatures can exceed 6000 °F. As accelerants, pyrotechnic materials are less efficient than typical accelerants on a pound for pound basis, because they contain an oxidizer in addition to fuel. However, they can generate much higher flame temperatures, and can deliver all their thermal energy in very short times.

As an example of the very high temperature and horrendous quantity of heat that can be generated pyrotechnically, consider the "Pyronol Torch." This is a device that was originally developed for underwater salvage operations. Although fairly simple in its construction, this item's chemistry is quite unusual. Its fuel consists of a mixture of aluminum and nickel powders; unusual in that they can react together in an alloying reaction to produce heat, even without an oxidizer. Its oxidizers are iron oxide (rust) and Teflon; unusual in that few would recognize either of these chemicals as being an oxidizer. When a Pyronol Torch is ignited, it produces a jet of vaporized iron which reportedly can penetrate four inches of steel in less than a second, even under 2000 feet of water!