

Original Research Paper

Chemical Science

EFFECT OF WATER ON BURNING TIME OF GUN POWDER

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ABSTRACT Gunpowder was invented in China and knowledge of it was transmitted from the East to the West. Gunpowder weapons would have a profound impact on Eurasian states and societies, but historians have found that their application in the field was both gradual and uneven. The gun powder is also referred as black powder. The current standard for black powder manufactured by pyrotechnicians today is mixture of potassium nitrate, charcoal, and sulphur. The ratio may vary with respect to the application it is used for. The burning speed of this mixture determines its range of application. In this paper we have studied the effect of varied proportion of water on the burning Time of gun Powder.

KEYWORDS : GUN POWDER, BLACK POWDER, BURNING SPEED, PYROTECHNICS Etc...

Introduction:

Gunpowder is a low-explosive substance that is used as a propellant in firearms. It burns rapidly and produces a large amount of gas, which produces a pressure wave inside the gun barrel, sufficient to propel a shot charge, bullet or projectile from a shotgun, rifle, or artillery piece.

Black powder is a mixture of potassium nitrate more commonly known as saltpetre, sometimes spelled "saltpetre," carbon in the form of charcoal, and sulphur with a ratio (by weight) of approximately 15:3:2 respectively. (Less frequently, sodium nitrate is used instead of saltpetre.) Modern black powder also typically has a small amount of graphite added to it to reduce the likelihood of static electricity causing loose black powder to ignite. The ratio has changed over the centuries of its use and can be altered somewhat depending on the purpose of the powder.

Nitrates have the property to release oxygen when heated, and this oxygen leads to the fast burning of carbon and sulphur, resulting in an explosion-like chemical reaction when gunpowder is ignited. The burning of carbon consumes oxygen and produces heat, which produces even more oxygen, etc. The presence of nitrates is crucial to gunpowder composition because the oxygen released from the nitrates exposed to heat makes the burning of carbon and sulphur so much faster that it results in an explosive action, although mild enough not to destroy the barrels of the firearms.

The combustion of gun powder takes place as per following equation:

$2\,\texttt{KNO} + \texttt{S} + 3\texttt{C} \mathop{\rightarrow} \texttt{K}\,\texttt{S} + \texttt{N} + 3\texttt{CO}$

A simplified form of above equation can be written as:

 $10\,\text{KNO} + 3\text{S} + 8\text{C} \rightarrow 2\text{K}\,\text{CO} + 3\text{K}\,\text{SO} + 6\,\text{CO} + 5\text{N}$

The products of burning obtained from above reaction do not follow any simple burning equation. Their can be vast range of burning products which may be generated during the course of reaction.

In this paper we will discuss about the burning time of gunpowder with respect to the quantity of water added.

Experimental design:

Total Five experimentation was carried out by keeping the percentages of potassium nitrate: charcoal: Sulphur as 75:15:10 and varying the water from zero to 0.0675% and studied the behaviour of the different composition made using the above composition.

The composition was mixed for around six hours to make the

mixture homogenous and to ensure the proper intermixing of the ingredients in the system.

The burning time was noted by taking known quantity of mixture and burning it and noting the time taken for complete burning.

Process Flow of Gun Powder Manufacturing:



Observations: Following observation have been made:

SR. NO.	WATER (%)	BURNING TIME IN SECONDS
1	0	6.30
2	0.0135	5.00
3	0.0270	4.23
4	0.0405	3.63
5	0.0540	3.20
6	0.0675	1.65

Graph of Burning Time Vs. Water (%):



RESULT AND DISCUSSIONS:

Form the observations what we have made during the experimentation, it was observed that the burning time was reduced as the water concentration was increased, it can be seen from the graph that the results has shown linear trend in reduction of burning speed. The highest burning speed was obtained when water concentration was at 0.065%.

VOLUME - 11, ISSUE - 05, MAY - 2022 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

CONCLUSION:

From the above results it can be concluded that for increasing the burning speed of the gun powder a particular quantity of water must be added in the pure composition. The water acts as the enhancer of burning speed up-to certain percentage.

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