S centuries ago. this was named black powder

s electrons, and itsoxidation state increases after a reaction. One example of an oxidation reaction is: C + O2CO2(s)(g)(g)In this reaction, the carbon has become oxidised (gained oxygen) and itsoxidation state has changed from 0 to +4. Explosive reactions are oxidation reactions that happen very quickly andexothermically, and where more gases are released to cause greaterpressure, and thus an explosion. An example of this is the ignition of black powder: KNO3 + 3C + SK2S + N2 + 3CO2 (s)(s)(s)(s)(g)(g)Source 1In this reaction, The C and S are fuels and the KNO3 is an oxidiser.

Theproducts are mainly gases, which cause an increase in pressure. Thereaction happens quickly because there is oxygen contained in the reactantKNO3, this means the oxygen is available immediately, which allows the Cand S to burn extremely quickly. The extent of explosive reactions depend on the speed of the reaction, energy released, and amount of pressure created due to the production ofgases. 2. The earliest explosive is believed to have been invented in Chinacenturies ago. This was named black powder which is composed of compressedpotassium nitrate, Sulphur and Charcoal. This was used for centuries forfireworks and warfare. One problem with it being used in warfare was that the explosion produced alot of smoke, which obscured sight.

In battles where there was extensiveuse of black powder (or gun powder when used in guns as a propellant) thegrounds were covered in smoky fog. Nitrocellulose (or Gun cotton) was accidentally discovered by Dr ChristianSchnbein in 1846 when he was experimenting with acids at home. Hisdiscovery led to the research of Nitrocellulose in the 1860s for use inwarfare. A year later, Ascanio Sobrero was also experimenting with

concentratedacids, mixing nitric and sulphuric acid together, along with glycerine (amore chemically accurate name is glycerol as it was later discovered to bean alcohol). He found that this yellow oil was a very unpredictable explosive that couldbe detonated by the touch of a feather. This new explosive was namedNitroglycerine. Later, a scientist called Alfred Nobel continued Sobrero's research, makingNitroglycerine safe by mixing it with Kieselguhr (a silica-based mineral, similar to clay). The resulting paste was shaped into rods to form sticksof dynamite which would only detonate when intended.

Nobel had invented thefirst safe high explosive. This explosive was difficult to detonate withfire or a fuse, and so Nobel used a smaller explosion to detonate theDynamite. He used small amounts of black powder to do this. This was later made more effective by replacing the Kieselguhr withsubstances that had similar properties but would themselves burn orexplode. This was called Dynamite no. 2.

He later thought of usingcollodion, partially nitrated cellulose, instead of fully nitratedcellulose. The result was a stiff jelly-like mass called blasting jelly, which was more effective than dynamite, for both the nitroglycerine and thecollodion were explosive. By the 20th century, black powder used in guns was replaced by smokelesspowder made from Nitrocellulose. Unlike black powder, this explosive couldbe detonated by percussion, therefore a fuse was unnecessary.

The British army developed smokeless powder called cordite in the 1880s, made from Cellulose trinitrate and glycerol trinitrate. The end product is not

in fact an explosive, but merely a very rapidignition that creates pressure from the produced gases. Source 2During the second world war, TNT (trinitrotoluene) was developed, which hasNO2 nitro groups and not -O-NO2. Because it does not react with metals andhas a melting point of 81oc, it could be poured into metal artillery shellsand bombs. 3. For a reaction to be explosive, it must happen extremely quickly, itmust be exothermic (heat discharged), and gases must be produced. The reaction can happen quickly because the oxygen source is containedwithin the reactants.

This is because the oxygen is available immediately. The more oxygen available, that faster the reaction can happen. For the reaction to be exothermic, bonds in the molecules must be broken, causing heat energy to be released. How much energy released depends on thebond enthalpies between each atom. For example the N-O bond has an enthalpy of +214kJ mol-1, the N= O has+587kJ mol-1. When hot gases are produced in a confined space there is a big rise inpressure.

When this happens very quickly, it can be called an explosion. Nitroglycerine C3H5N3O93CO2 + 21/2H2O + 11/2N2 + 1/2O2(l)(g) (g) (g)(g)1 mol of liquid 7. 25 mols of gasThis equation shows how 1mol of Nitroglycerine, a high explosive, produces7. 25mols of gas, whereas black powder only produces 4mols of gas from 5molof reactants: KNO3 + 3C + SK2S + N2 + 3CO2 (s)(s) (s)(s)(g)(g)5mol of solid1mol of solid, 4 of gas4. Propanone was in demand during the first world war and new methods ofproduction had to be invented. Previously propanone was produced by the drydistillation of wood excluding air.

In 1914 Chaim Weizman used bacterial fermentation of starch from maize toproduce propanone. Later on, a lack of Maize resulted in the use of conkersusing the same process. This however was less efficient.

Later, propanone was produced by passing propan-2-ol vapours over a coppercatalyst. The source of the propan-2-ol is propene, a result of crude oilcracking. 5.

Safety during the development of these explosives was relatively poor, as some scientists would experiment in their own homes, despite workingwith dangerous and explosive chemicals. There were many accidents, including that of Nobel's factory which resulted in the ban of explosivemanufacture near residential areas in Sweden. Those manufacturing some of these explosives also had illnesses such as ' NGhead' where Nitroglycerine was produced. However, Nitroglycerine can be used beneficially in the treatment of anginapectoris.

The production of TNT caused headaches, anaemia and skin irritation in theworkers. Nowadays there are strict regulations enforced by the Healthy and SafetyExecutive, which provides detailed information on dangers of explosives andprotection of workers against chemical effects. Source 3_____Sources: 1.

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http://www. hse. gov. uk/comah/sragcwh/hazards/haz5. htm’Salter’s Advanced Chemistry: Chemical Ideas’ book was also used as areference.

————————–Page 1 word count: 454Page 2 word count: 346Page 3 word count: 178Total word count: 978 (excluding equations)Explosives and their History