

UNITED STATES PATENT OFFICE

CHARLES CHESTER AHLUM, OF CHESTER, PENNSYLVANIA, ASSIGNOR TO E. I. DU PONT DE NEMOURS & COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE

EXPLOSIVE AND PROCESS OF MANUFACTURE

No Drawing.

Application filed April 20, 1928. Serial No. 271,657.

This invention relates to a process of nitrating polyhydroxy alcohols having from four to six carbon atoms by mixing them with liquid polyhydroxy alcohols and subjecting to the action of a nitrating acid, and to the explosive produced thereby.

Polyhydroxy alcohols having from four to six carbon atoms such as erythritol, arabitol, sorbitol, and their various isomers when nitrated alone with mixed acid give pasty products or syrups of high viscosity which are difficult to purify.

I have found that by mixing polyhydroxy alcohols having from four to six carbon atoms, such as mentioned above, with liquid polyhydroxy alcohols, such as glycerine and glycol, I obtain a product which when nitrated is a fluid oil of sufficiently low viscosity to be readily purified and stabilized by the usual methods of nitroglycerin practice. In general the yields and nitrogen content of the nitrated polyhydroxy alcohol having from four to six carbon atoms are greater when nitrated in solution as described above, than when nitrated alone.

A particular object of this invention is the development of an economic process for the nitration of polyhydroxy alcohols having from four to six carbon atoms and one that is practical from the viewpoint of handling. Other objects will appear as the description proceeds.

The explosive products obtained as described above are valuable in supplanting nitroglycerine. I am aware that cane sugar has been nitrated in combination with glycerine. By using sorbitol in place of cane sugar I have found that I gain several distinct advantages over the latter. For example, using a solution of 80 parts glycerine and 20 parts of sorbitol, I obtain an oil of higher nitrogen content and greater strength than when I use a similar solution of 80 parts glycerine and 20 parts of cane sugar. The explosive thus obtained from sorbitol also has a lower viscosity, which is of considerable advantage in washing, handling, and incorporating into dynamite. Instead of 20 parts sorbitol I may use from 10 to 90 parts sorbitol, the remainder of the mixture being liquid

polyhydroxy alcohols. Instead of sorbitol I may use such polyhydroxy alcohols having from four to six carbon atoms as mannitol, arabitol or erythritol, though for some purposes these are not quite as satisfactory as sorbitol due to the fact that when nitrated they give products which are not as soluble as nitrosorbitol in nitroglycerine.

A preferred example of my process and resultant explosive is the following. I may, for example, dissolve 50 parts of sorbitol in 50 parts of glycerine. This solution when added to the usual nitroglycerine mixed acid gives a fluid oil which separates on the surface of the waste acid. This oil can be readily washed to neutrality using a dilute sodium carbonate solution such as is customary in nitroglycerine practice. The neutral oil thus produced has a high nitrogen content and excellent stability. It is a valuable explosive oil for use in dynamites, where it may displace in part or in whole the usual liquid explosive ingredients.

In carrying out my process, the proportions of polyhydroxy alcohols having from four to six carbon atoms and liquid polyhydroxy alcohols may, if desired, be as follows:—

10% to 90% sorbitol
90% to 10% glycerine

10% to 90% sorbitol
90% to 10% ethylene glycol

10% to 90% sorbitol
45% to 5% glycerine
45% to 5% glycol

In place of using a solution of polyhydroxy alcohols having from four to six carbon atoms in liquid polyhydroxy alcohol, I may use them in admixture or add them separately to the nitrator. In place of sorbitol I may use erythritol, mannitol, arabitol or any other polyhydroxy alcohol having from four to six carbon atoms or mixture of polyhydroxy alcohols having from four to six carbon atoms. In place of glycerine I may use ethylene glycol, propylene glycol, butylene glycol, chlorohydrin, diglycerine or any

other liquid polyhydroxy alcohol or mixture of liquid polyhydroxy alcohols.

By proceeding in the manner I have described I am able to keep polyhydroxy alcohols having from four to six carbon atoms and their nitric esters in sufficiently fluid condition so that they can be handled practically on a large scale. I also obtain an explosive oil which is an excellent practical explosive.

By the term polyhydroxy alcohols having from 4 to 6 carbon atoms I mean to exclude the sugars and also the polyglycerines and polyglycols.

As many apparently widely different embodiments of this invention may be made without departing from the spirit thereof, it is to be understood that I do not intend to limit myself to the specific embodiments thereof except as indicated in the appended claims.

I claim:—

1. The process of producing explosives which comprises nitrating mixtures of polyhydroxy alcohols having from four to six carbon atoms and liquid polyhydroxy alcohols.

2. The process of producing explosives which comprises nitrating mixtures of polyhydroxy alcohols having from four to six carbon atoms with liquid polyhydroxy alcohols in which the content of the mixture of polyhydroxy alcohols having from four to six carbon atoms varies from 10 to 90 parts by weight.

3. The process of producing explosives which comprises nitrating mixtures of polyhydroxy alcohols having from four to six carbon atoms and glycerine and glycol.

4. The process of producing explosives which comprises nitrating mixtures of polyhydroxy alcohols having from four to six carbon atoms and glycerine.

5. The process of producing explosives which comprises nitrating mixtures of glycerine and glycol and a polyhydroxy alcohol taken from a group consisting of erythritol, sorbitol, mannitol, and arabitol.

6. The process of producing explosives which comprises nitrating mixtures of sorbitol and glycerine.

7. An explosive which comprises nitrated polyhydroxy alcohols having from four to six carbon atoms and nitrated liquid polyhydroxy alcohols.

8. An explosive which comprises nitrated mixtures of polyhydroxy alcohols having from four to six carbon atoms and liquid polyhydroxy alcohols.

9. An explosive which comprises nitrated mixtures of polyhydroxy alcohols having from four to six carbon atoms and glycerine and glycol.

10. An explosive which comprises nitrated mixtures of polyhydroxy alcohols having from four to six carbon atoms and glycerine.

11. An explosive which comprises nitrated

mixtures of glycerine and glycol and a polyhydroxy alcohol taken from a group consisting of erythritol, sorbitol, mannitol and arabitol.

12. An explosive which comprises nitrated mixtures of glycerine and a solid polyhydroxy alcohol taken from a group consisting of erythritol, sorbitol, mannitol, and arabitol.

13. As new articles of manufacture, explosives comprising nitrates of a polyhydroxy alcohol having from four to six carbon atoms and of ethylene glycol.

14. As new articles of manufacture, explosives comprising nitrates of sorbitol and of ethylene glycol.

15. The process of producing explosives which consists in nitrating a mixture comprising a polyhydroxy alcohol having from four to six carbon atoms and a liquid polyhydroxy alcohol.

16. The process of producing explosives which consists in nitrating a mixture comprising a polyhydroxy alcohol having from four to six carbon atoms and ethylene glycol.

17. The process of producing explosives which consists in nitrating a mixture comprising sorbitol and ethylene glycol.

18. The process of producing explosives which consists in nitrating a mixture comprising a polyhydroxy alcohol, having from four to six carbon atoms, ethyleneglycol and glycerol.

19. The process of producing explosives which consists in nitrating a mixture comprising sorbitol, ethyleneglycol and glycerol.

20. As new articles of manufacture, explosives comprising nitrates of ethylene glycol and nitrates of a compound taken from a group consisting of erythritol, sorbitol, mannitol, and arabitol.

21. The process of producing explosives which consist in nitrating a mixture comprising ethylene glycol and a solid polyhydroxy alcohol taken from a group consisting of erythritol, sorbitol, mannitol, and arabitol.

In testimony whereof, I affix my signature.

CHARLES CHESTER AHLUM.