A NOVEL INVESTIGATION OF NANOPARTICLES GLUCOSE PENTA ACETATE AND THEIR COMPARATIVE STUDY.

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ABSTRACT

In recent years, nanotechnology is an escalating field of modern research involving in synthesis design, characterization, production, and application of structures, devices, and systems by controlling shape and size at the nanometer scale. Nanotechnology also involves the synthesis of nanoparticles. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives. To achieve the principle of green chemistry process, it leads to in search of green synthesis of nanoparticles. Here we havesynthesized Glucosyl PentaAcetate using glucose and acetic anhydride in the presence of perchloric acid. The identities of newly synthesis compounds have been established based on usual chemical transformation and U.V, SEM, TEM Analytical studies.

Keywords: *Glucose, Acetic Anhydride, and Glucosyl PentaAcetate*

Introduction

The field of nanotechnology is one of the most active research areas in modern materials science. Nanoparticles exhibit new or improved properties based on specific characteristics such as size, distribution, and morphology. There have been impressive developments in the field of nanotechnology in the recent past years, with numerous methodologies developed to synthesize nanoparticles of particular shape and size depending on specific requirements. New applications of nanoparticles and nanomaterials are increasing rapidly.

Nanotechnology, as defined by size, is naturally very broad, including the field of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, energy storage, microfabrication, molecular engineering, etc. The associated research and applications are equally diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale. Nanotechnology may create many new materials and devices with various applications, such as in Nanomedicines, Nanoelectronics, and biomaterial energy production and consumer products.

Lipid-based Nanocapsulation systems are useful in the properties of antioxidants. It enhances the performance of antioxidants just by improving their solubility. Antioxidants protect our body against age-related, and chronic deceases. When antioxidants are given in their free form, they cannot pass cell membranes, so can easily be cleared from the general circulations reason behind the usefulness of nanocapsulation.[1]

Carbohydrates arean important, abundant, and a fundamental class of biomolecules containing Carbon, Hydrogen, and oxygen. The old view on carbohydrate as a natural energy source (starch and glycogen) and structural material (e.g., cellulose, collagen, proteoglycans, and DNA backbone) have expanded, and it is a fact that the role of carbohydrate is much more sophisticated and complex. Today carbohydrates are known to have a variety of functions in mammal [1-5]. Carbohydrates play an essential role in a vast array of biological processes, and mainly there are many advantages; for example, carbohydrate-based drugs show low toxicity and immunogenicity[6]. Thus because of biological importance, carbohydrates have aroused much interest in synthetic and medicinal chemistry[7, 8].

Carbohydrates derivatives have been extensively investigated, including synthesis, characterization, and biological activity. Partly due to the fact that many naturally occurring saccharides and synthesized analogs exhibit

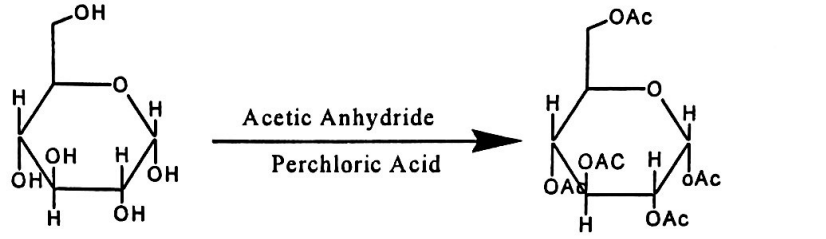
various and potent biological activities, and they have been widely employed as agrochemicals and pharmaceuticals.

Results And Discussion

Nanoparticles

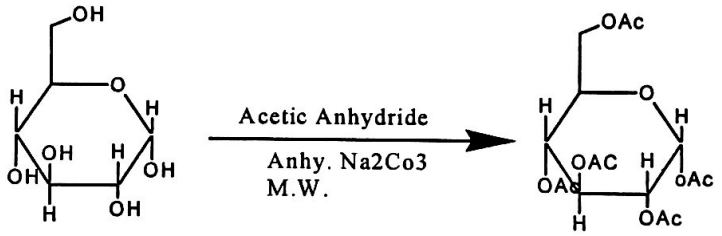
A nanoparticle isa sub-classification of the ultrafine particle with lengths in two or three dimensions greater than 0.001 micrometer (1 nanometer) and smaller than about 0.1 micrometer (100 nanometers) and which may or may not exhibit a size-related intensive property. This term is a subject of controversy regarding the size range and the presence of a size-related property. Current usage emphasizes size and not properties in the definition. The length scale may be a hydrodynamic diameter or a geometric length appropriate to the intended use of the nanoparticle. The chemistry of thiourea of carbohydrates is extensively elaborated and well documented. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives

Reaction Scheme:



Glucose Glucose Penta Acetate

OR



Glucose Glucose Penta Acetate

Here Glucose Penta Acetate was synthesized by both methods; conventional and Microwave method.Glucose was reacted with acetic anhydride in the presence of perchloric acid at room temperatureafter the reaction product was poured in ice-cold water and separated the product as Glucose Penta Acetate. The product is confirmed based onthe melting point and other studies.

Experimental

1. Preparation Of Glucose Pentaacetate:

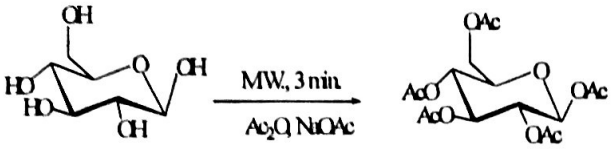
A) Preparation of Glucose Penta Acetate by Conventional Method :

1) Preparation of Glucose PentaAcetate :

To an ice-cold acetic anhydride (30 ml), perchloric acid (0.25 ml) was added. To this pale yellow solution, gradually, glucose (10 g) was added with constant shaking and cooling. After the addition of glucose, the reaction mixture was kept 2 hr. at room temperature. The content of the conical flask was then poured into ice-cold water. When Glucose Penta Acetate was precipitated out, it was filtered, washed with water, and dried (18 g) yield 74%. It was crystallized from ethanol, m.p. 105 – 110°C.

B) Microwave-assisted preparation of Glucose Penta Acetate.

Peracetylation of maltose to give the acetyl derivative with a small excess of acetic anhydride under the catalyst of Potassium or Sodium acetate (anhydrous) was found practically quantitative in less than 15 min with microwave heating.



Glucose Glucose Penta-acetate

Herein, we report the peracetylation of maltose in the molecular proportion of acetic anhydride (30 ml) using catalyst sodium acetate. 0.8 gm. Under Microwave heating, the reaction was complete less than 05 min. The product was isolated by pour in ice-cold water with constant stirring and cooling.

The Glucose Penta Acetate is separated out; purification of the product was done under the water-ethanol system. The melting point of maltose octa acetate was found to be 105-110°C.

Table No.1:- Study of peracetylation of D-glucose using acetic anhydride and an appropriate amount of catalyst

Sr. No.	Amount of Glucose	Vol. of acetic anhydride	Amount of catalyst	Power	Time	Yield
1	10.0 gm	20 ml	0.8 gm	20-60	5 min	80%
2	10.0 gm	30 ml	0.8 gm	20-60	3 min	90%
3	10.0 gm	25 ml	0.8 gm	20-60	4 min	78%
4	10.0 gm	15 ml	0.8 gm	20-60	4 min	65%
5	10.0 gm	35 ml	0.8 gm	20-60	4 min	75%
6	10.0 gm	25 ml	0.4 gm	20-60	8 min	70%
7	10.0 gm	25 ml	1.2 gm	20	8 min	60%

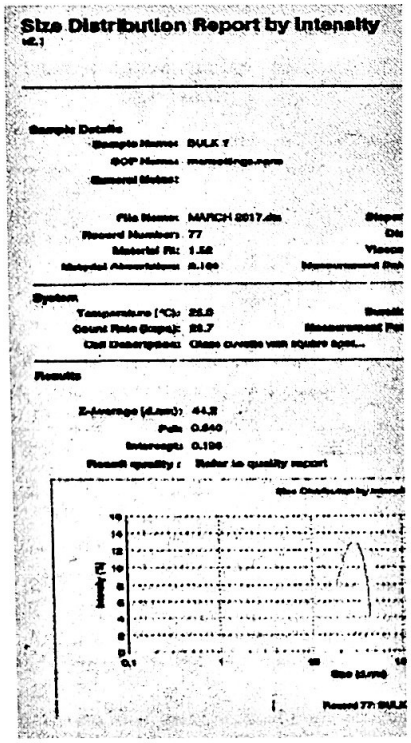
Preparation of Nanoparticles of Glucose Penta Acetate:

Take about 1 gm of Glucose Penta Acetate and dissolve it completely in the 20ml of solvent in a 250 ml beaker. Now put this beaker in a sonicator. The highly penetrating acoustic waves are passed through the mixture, which creates high-pressure bubbles in the beaker due to which breakdown of the bulk material took place and desired sized nanoparticles are formed. The size determination of nanoparticlesis done by the X-ray diffraction studies

Characterization of Nanoparticles

1. Characterization using UV-Spectrophotometer: Single Beam UV-Spectrophotometer with software BI/CI/SP/SB-S-03 of Bio Era make. The UV-Visible Spectroscopy reveals the formation of Nanoparticles Characterization of Nanoparticles was done using a visible Spectrophotometer by using a model by showing different absorption those from bulk material.

2. Size determination ofGlucose Penta Acetate, Nanoparticles by X-ray Diffraction studies(Particle Size Analysis): From the X-ray diffraction, it comes to know that size of nano Glucose Penta Acetate is 42.29 nm.



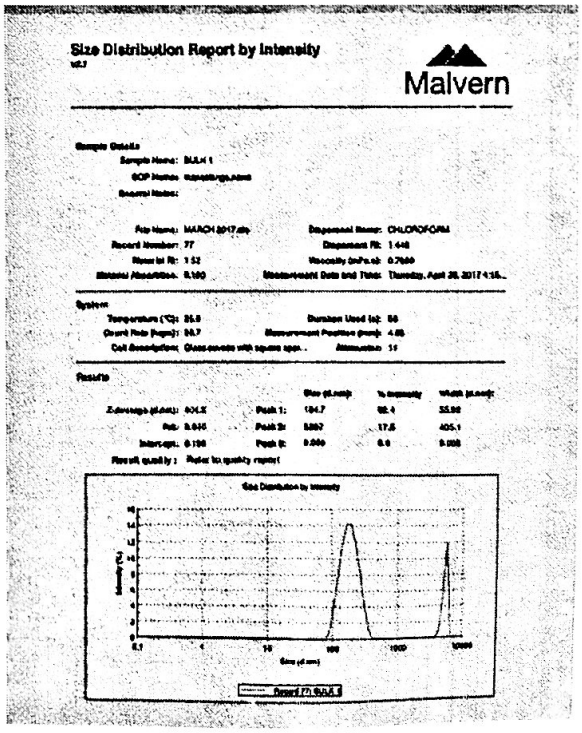


Table No. 2:- Comparative Study of Nanoparticles of glucose Penta acetate

-Nano of Glucose Penta Acetate	M.P. °C	Particle Size	Conventional method	Microwave Method		
			Time (hrs)	% Yield	Time (min.)	% Yield
Glucose Penta Acetate	105-110	44.2nm	3	65.12	5	80

Conclusion

From the above study, it is clear that nanoparticles of Glucose Penta Acetate remain the same in both Conventional and Microwave methods, but regarding the purity of the product,the microwave method products are purer as compare to the conventional product.

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