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Formation and Spectral with Nano-Study of Six and Seven Membered Ring Derivatives

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Abstract

The nanoscale properties of some organic chemicals make the materials have multiple engineering, chemical, biological and industrial applications, including heterocyclic derivatives. Advanced research in this field has made it possible to use them widely as fluorinated materials and in the electronics industry. These derivatives also have good stability at different temperatures due to the presence of heterogeneous atoms within their structure. These cyclic derivatives have proven their biological effectiveness against many types of fungi and bacteria and have given complexes similar to these systems in modern research, they have common properties in hardness and softness, as well as their pharmaceutical uses in treating many diseases such as cancer due to their antioxidant activity. Through this research, ring nanocomposites were formed that have nanoscale and biological properties. They were studied spectroscopically and through the proton and carbon resonance spectra of all derivatives, red spectral frequencies, and the nano-optical microscope.

Keywords: Nano, chemical compound, heterocyclic, six membered, oxazepane, seven membered

INTRODUCTION

Recently, research has focused on measuring and studying the nano-properties of chemically prepared derivatives due to their wide role in many applications in various fields of science. Heterocyclic derivatives have a wide range of biological applications in various fields such as agriculture (pesticides and herbicides), petroleum (lubricants and dyes), pharmaceuticals (antibacterial, antitumor, anti-inflammatory, antidiabetic) and analytical reagents, as well as antimicrobials that have shown strong inhibition against all bacterial and fungal strains. The importance of cyclic derivatives is highlighted by its numerous applications in various scientific fields, for example, pharmaceutical industry, drug discovery, luminescent materials as well as dye industry. It is also worth noting that compounds containing the hexagonal ring exhibit a wide range of biological activities such as anticancer, antiparasitic, antifungal, antibacterial, antidepressant, antituberculosis and anti-inflammatory [1-6]. The most important scientific ones are: Transmission Electron Microscope (TEM), Scanning Electron Microscope (SEM), Atomic Force Microscope (AFM) with dielectrics, and X-ray Diffraction (XRD). Scanning electron microscope (SEM): An electron microscope that photographs the surface of a sample by means of an electron beam that is focused on the surface being studied. It interacts with the electrons of the sample and the beam scattered from it can be represented as an image of the sample, with a magnification power of up to half a million times, from which we know the degree of quality of the sample. This method was used in current research. There are various devices for examining and characterizing nanostructures of different types and shapes. These types of devices

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are highly accurate and efficient and require a staff experienced in their use [7-12]. These devices are usually connected to computers and run by special programs, in addition to being expensive. These devices can provide extensive information about nanostructures (called a sample when placed under examination in a specific device) in terms of shape, internal and electronic composition, etc. Samples are usually in solid form such as a slide or powder or in a liquid state. Some devices require the sample to be prepared in a specific way for the purpose of examination, while others do not require such preparation [13-20].

EXPERIMENTAL PATHS

Synthesis of Imine Derivative [1]

Dissolve (0.1 mole) of para-methoxy-amino antipyrine in (50 ml) of absolute ethanol while stirring the solution, gradually add (0.1 mole) of 2-formalpyridine with (3 drops) of glacial acetic acid with refluxing for 4hrs, and the mixture is elevated in a water bath. After (10 min), a yellowish-brown precipitate is formed with a high yield of up to (86%), and the elevation process continues on the mixture for (2 h) to complete the reaction. The resulting precipitate is filtered and recrystallized with ethanol, where yellowish-brown crystals of high purity are formed [21-25].

Synthesis of Cyclic Derivative [2]

Dissolve (0.1 mole) of Imine Derivative [1] in (40 ml) of absolute ethanol while stirring the solution, gradually add (0.1 mole) of amino propanoic acid with refluxing for 4hrs, a yellowish-orange precipitate is formed with a high yield of up to (82%), and the elevation process continues on the mixture for (2 h) to complete the reaction. The resulting precipitate is filtered and recrystallized, where yellowish-orange crystals of high purity are formed [21, 25].

Synthesis of Cyclic Derivative [3]

Dissolve (0.1 mole) of Imine Derivative [1] in (40 ml) of absolute ethanol while stirring the solution, gradually add (0.1 mole) of mercapto propanoic acid with refluxing for 5hrs, a yellow precipitate is formed with a high yield of up to (84%), and the elevation process continues on the mixture for (2 h) to complete the reaction. The resulting precipitate is filtered and recrystallized, where yellow crystals of high purity are formed [25-32].

Synthesis of Cyclic Derivative [4]

Dissolve (0.1 mole) of Imine Derivative [1] in (40 ml) of dry benzene while stirring the solution, gradually add (0.1 mole) of succinic anhydride with refluxing for 6hrs, orange precipitate is formed with a high yield of up to (88%), and the elevation process continues on the mixture for (2 h) to complete the reaction [21, 25]. The resulting precipitate is filtered and recrystallized, where orange crystals of high purity are formed in Photo 1.

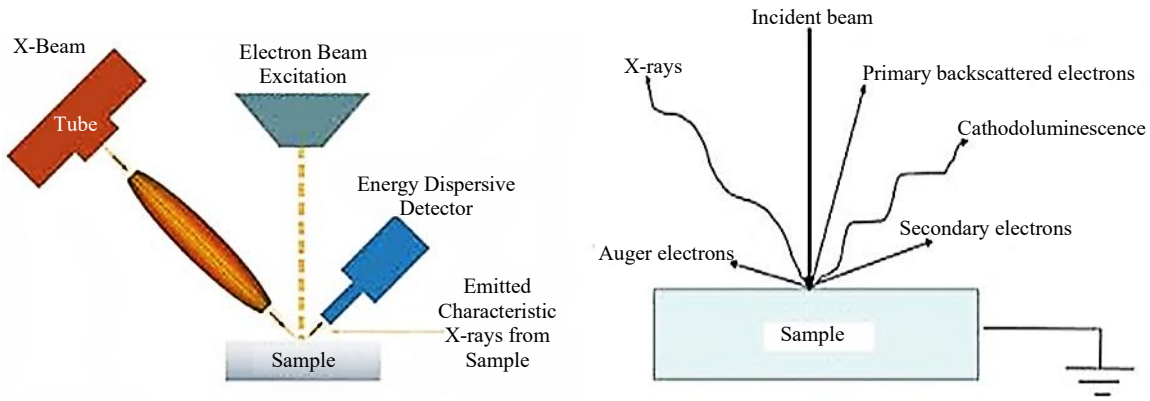

Photo 1. SEM-instrument of nanoic-measurements.

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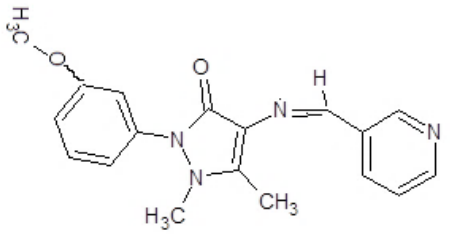
Synthesis of Derivative [5]

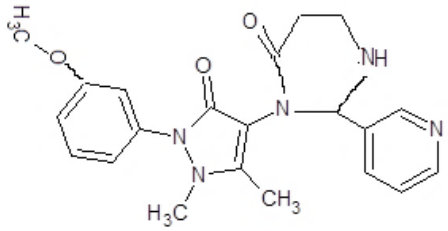
Dissolve (0.1 mole) of para-methoxy-amino antipyrine in (50 ml) of absolute ethanol while stirring the solution, gradually add (0.1 mole) of 4-formal-5-methoxy phenol with (3 drops) of glacial acetic acid with refluxing for 4hrs, and the mixture is elevated in a water bath. After (10 min), brown precipitate is formed with a high yield of up to (86%), and the elevation process continues on the mixture for (2 h) to complete the reaction in Scheme 1 & 2. The resulting precipitate is filtered and recrystallized with ethanol, where brown crystals of high purity are formed [21, 25]. Then reacted with (0.01 mole) with mercapto propanoic acid in 50 ml ethanol with refluxing for 5 hrs, to yield yellow derivative [5, 33-40].

Synthesis of Derivative [6]

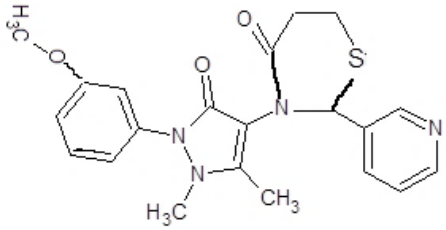
Dissolve (0.1 mole) of para-methoxy-amino antipyrine in (50 ml) of absolute ethanol while stirring the solution, gradually add (0.1 mole) of 4-formal-5-methoxy phenol with (3 drops) of glacial acetic acid with refluxing for 4hrs, and the mixture is elevated in a water bath. After (10 min), brown precipitate is formed with a high yield of up to (86%), and the elevation process continues on the mixture for (2 h) to complete the reaction. The resulting precipitate is filtered and recrystallized ,where orange crystals of high purity are formed [21, 25]. Then reacted with (0.01 mole) with succinic anhydride in 50 ml dry benzene with refluxing for 7 hrs, to yield orange derivative [5, 41-45].



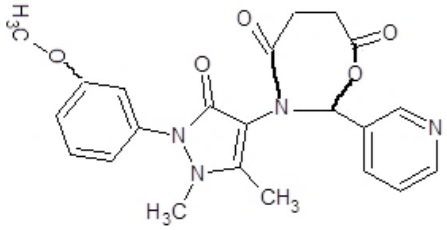
Compound [1]



Compound [2]

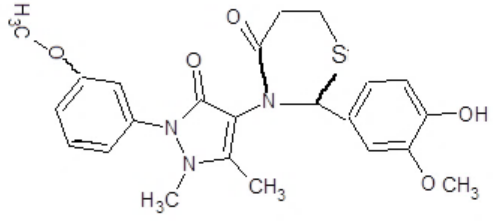


Compound [3]

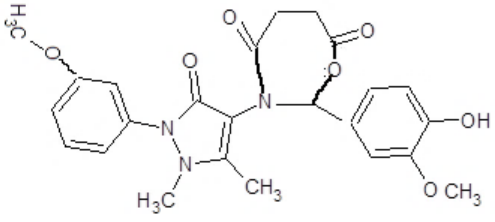


Compound [4]

Scheme 1. Designation of nano compounds [1-4].



Compound [5]



Compound [6]

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Scheme 2. Designation of nano compounds [5, 6].

RESULTS AND DISCUSSION

FT-IR- Spectral Measurements

A band appears in the far IR spectrum in the range (1658cm-1) approximately, which belongs to the frequency (CH=N) Imine group, and this band disappeared in compounds [2, 3, 4, 5, 6] for formation cyclic derivatives like (Oxazepane, Thiazane, Diazane,..) in addition to other bands in spectral (Figures 1 and 2).

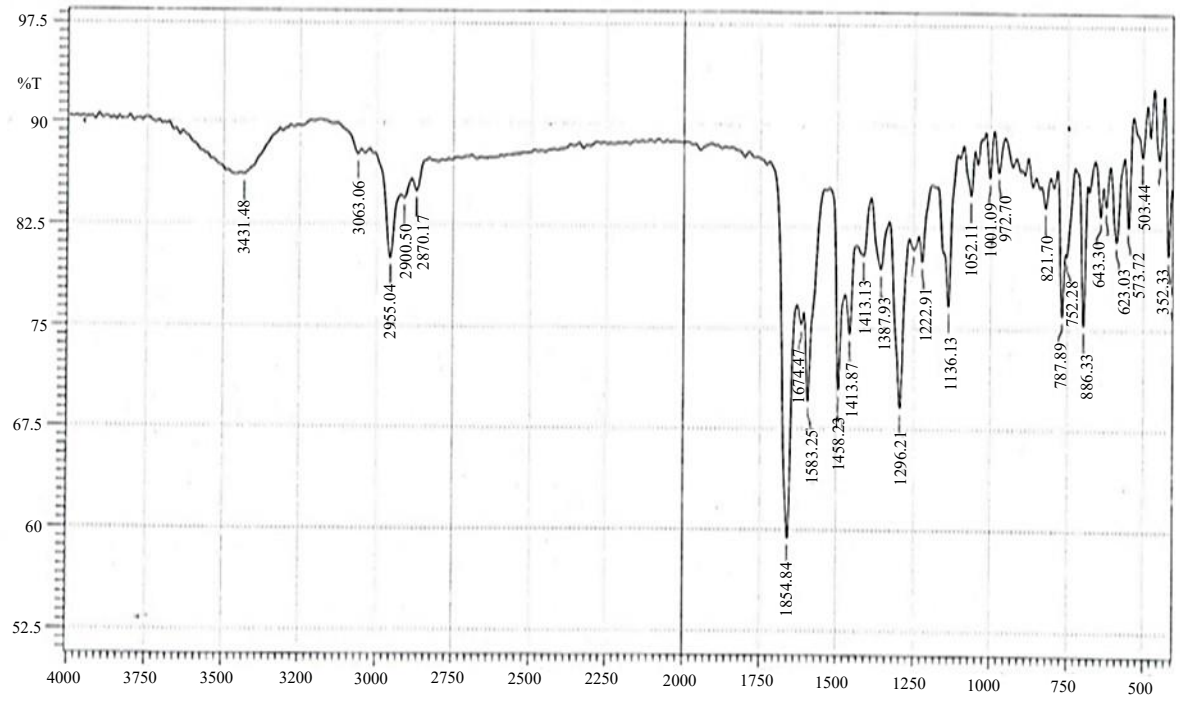

Figure 1. FT-IR of Comp. [1].

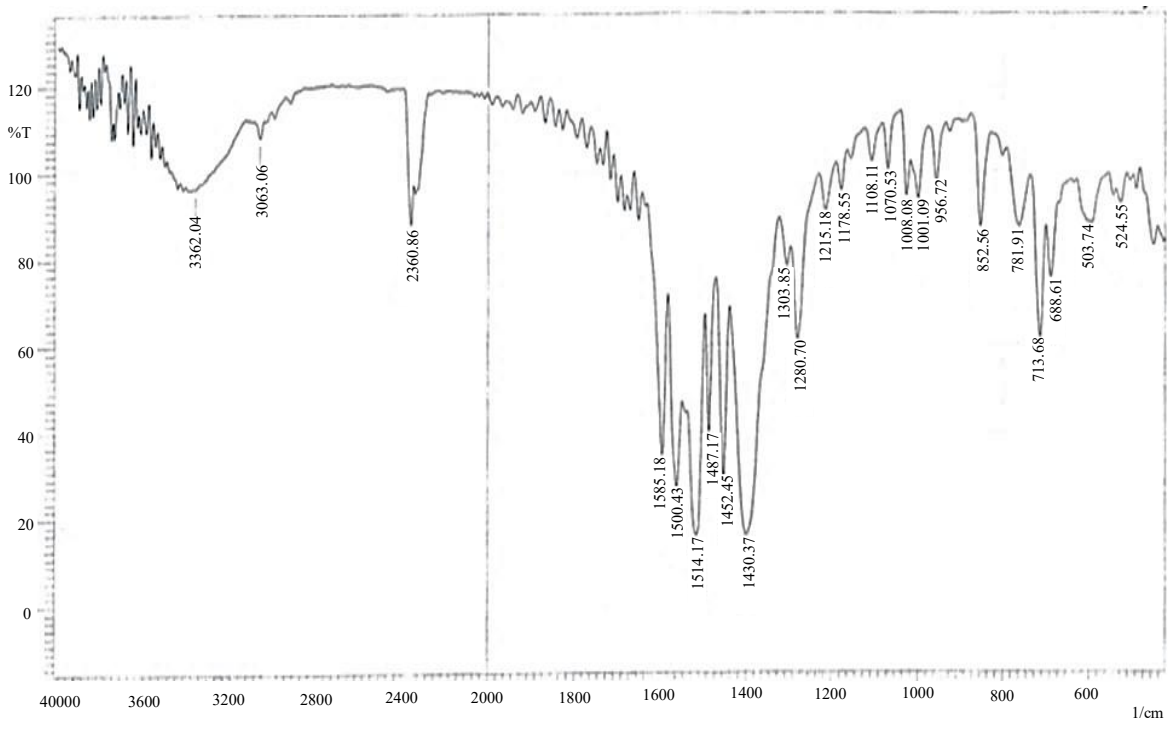

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Figure 2. FT-IR of Comp. [2].

H-NMR- Spectral Measurements

A signal appears in the resonance spectrum at (8.43) approximately, which belongs to the proton of (CH=N) Imine group, and this peak disappeared in compounds [2, 3, 4, 5, 6] for formation cyclic derivatives like (Oxazepane, Thiazane, Diazane,..) in addition to other bands in spectral Figures 3 and 4.

C-NMR- Spectral Measurements

A signal appears in the resonance spectrum at (151.33) approximately, which belongs to the carbon atom of imine group in (CH=N) of compound [1], and this peak disappeared in compounds [2, 3, 4, 5, 6] for formation cyclic derivatives like (Oxazepane, Thiazane, Diazane,..) in addition to other bands in spectral (Figures 5 and 6) [46-48].

Study of Nano-Properties of Cyclic Derivatives

Application of Nano properties by Electron Microscopy of the new Cyclic derivatives (for morphological properties) were carried out that revealed in this broadsheet that they have a spherical character also have granular proportions within the nano-scale they have an average size of (48.91, 41.76, 44.89) nanometers to Cyclic derivatives [3, 5, 6] respectively, so the surface portion growths also this specific sorts it eligible for health solicitations in arrears to its minor granular size, spherical figure within the nano-scale that is smeared in health grounds as a management for numerous systems of diseases as well as in the industrialized ground, figures at below act structure on created cyclic derivatives that have nano-properties according to studies [28, 54], (Figures 7–9).

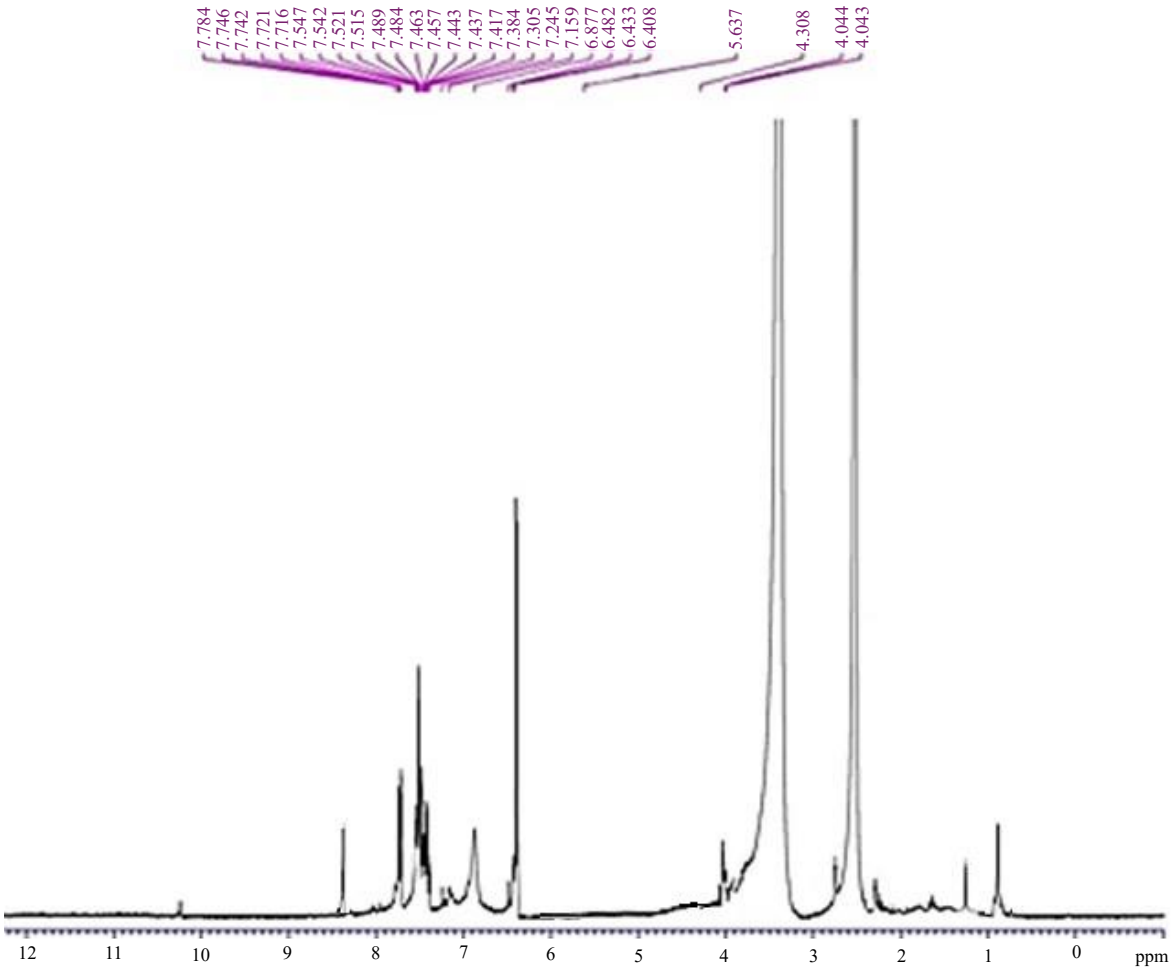

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Figure 3. H-NMR of Comp. [1].

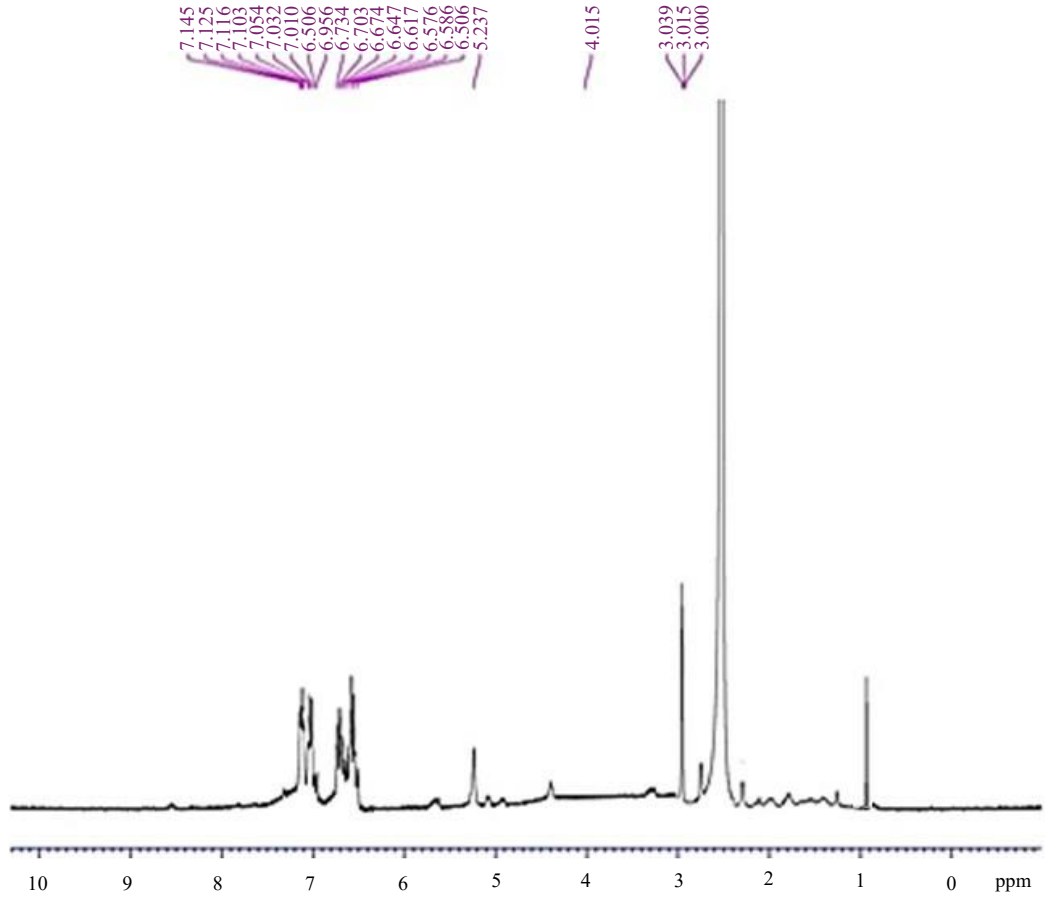

Figure 4. H-NMR of Comp. [2].

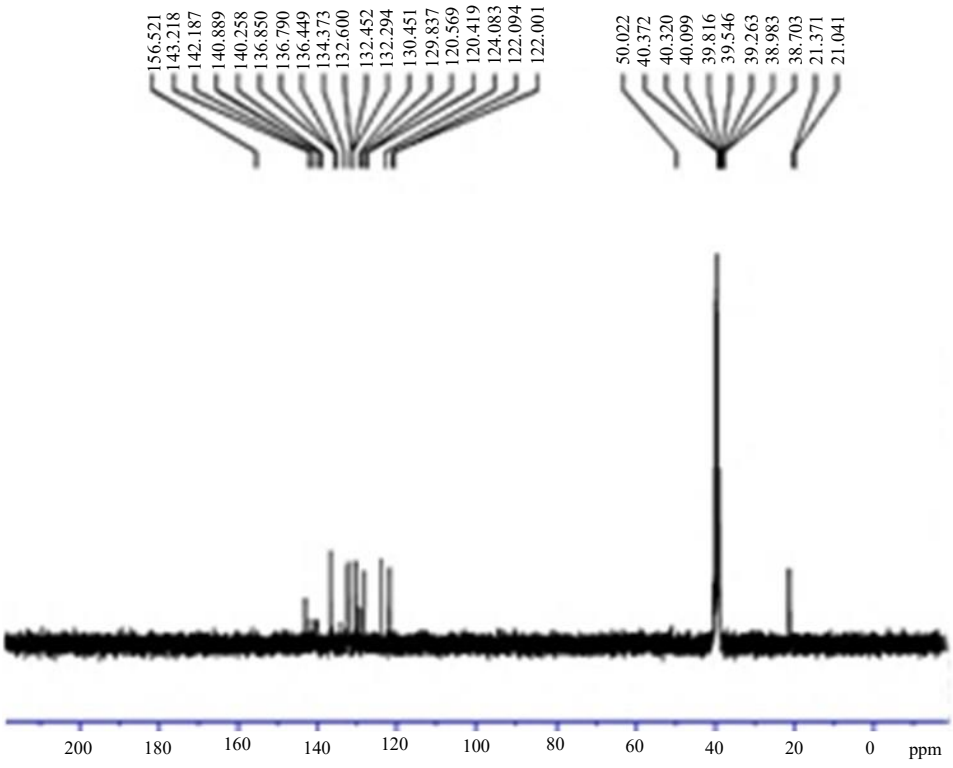

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Figure 5. C-NMR of Comp. [1].

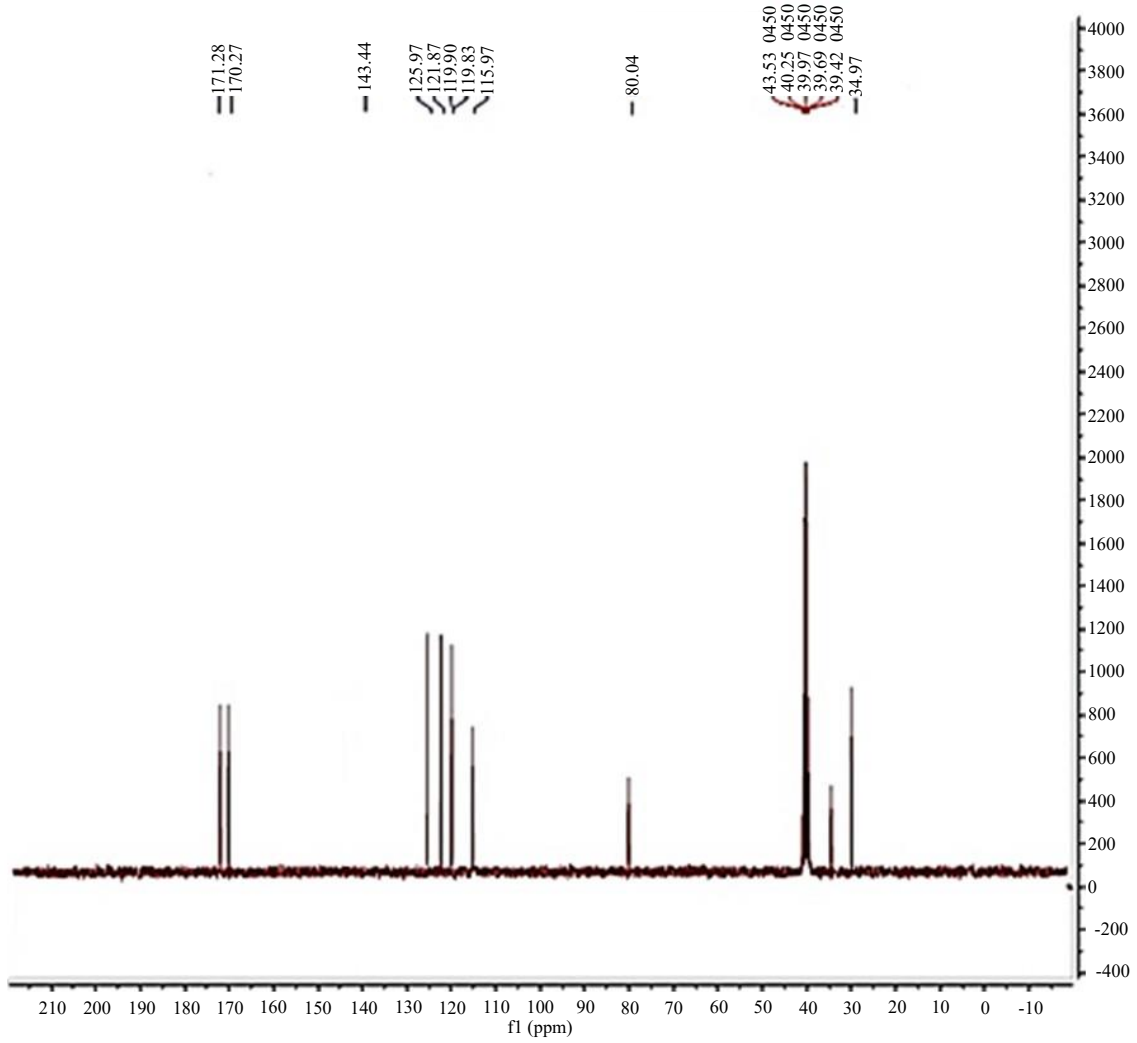

Figure 6. C-NMR of Comp. [6].

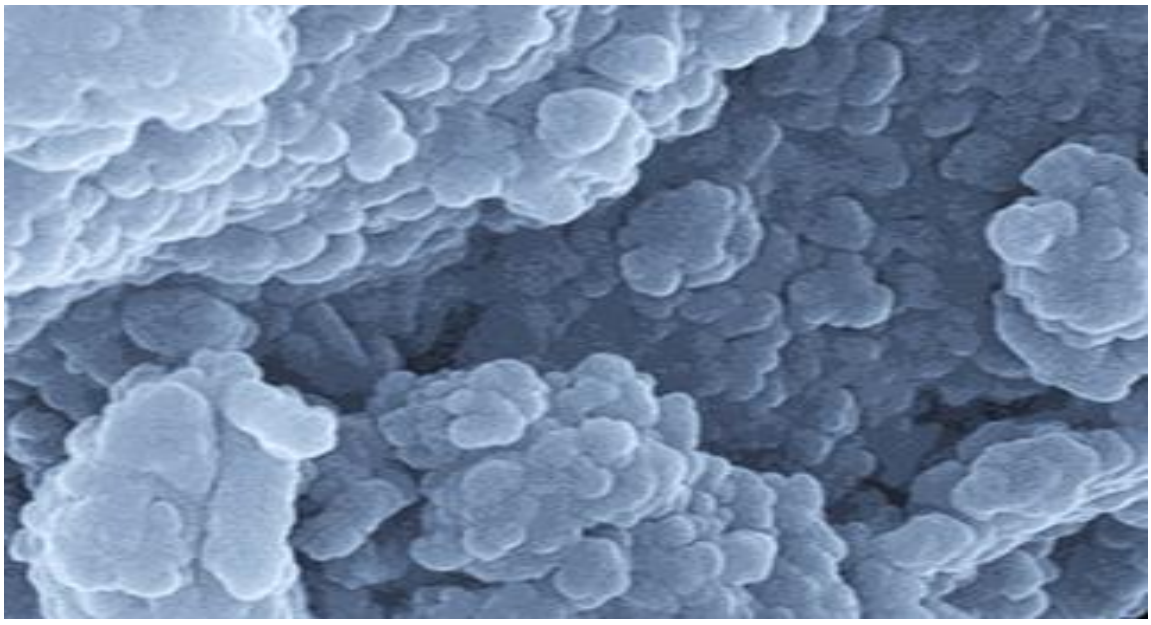

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Figure 7. SEM of Derivative [1] at preparation for 8 hrs.

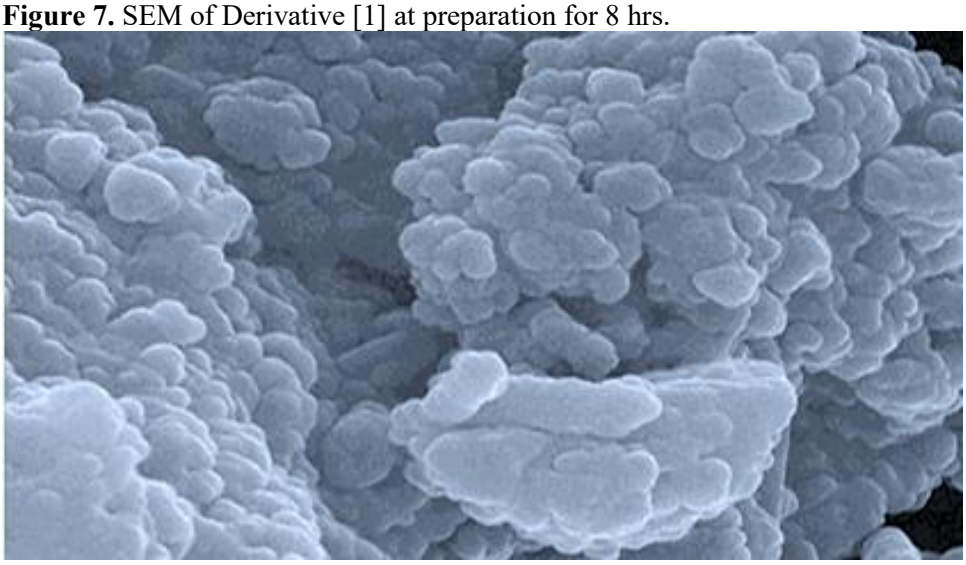

Figure 8. SEM of Derivative [3] at preparation for 8 hrs.

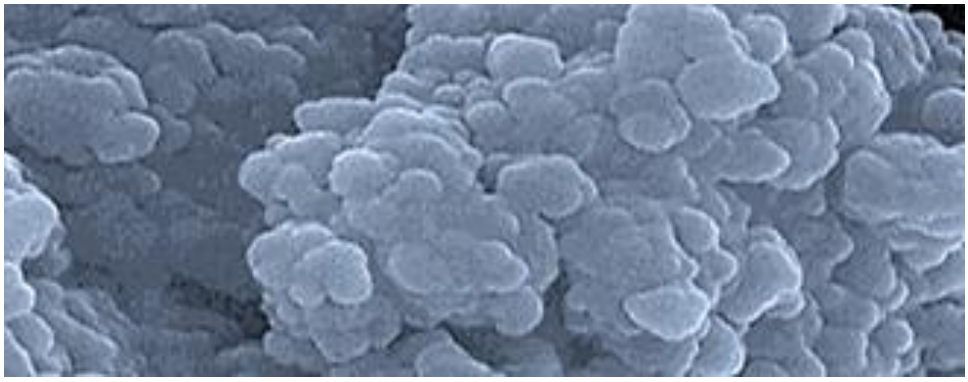

Figure 9. SEM of Derivative [6] at preparation for 8 hrs.

CONCLUSIONS

All studies followed in the research have proven the formation of cyclic derivatives and have given fixed and clear spectral frequencies. Studies of the nanoscale properties were also conducted using the optical electron microscope and have given good results confirming that the prepared derivatives possess nanoscale properties.

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