

Spectroscopic Investigations & Optical properties of Metal (Mn^{++}) of Carbon Nano Tubes

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Abstract: - Carbon nano tubes (CNTs) are emerging Nano materials. Carbon molecules have novel properties that make them potentially useful in many applications in nanotechnology, electronics, optics and other fields of materials science & other fields also. The complex of Transition Metal (Mn^{++}) with amino acids present in Egg albumin have been synthesized and to prepare of CNTs. The synthesized CNTs are characterized by NMR, IR and PL Spectroscopy. At high temperature, amino acid metal complex is decomposed and to obtain metal carbon Nano tubes.

Key words- Mn^{++} , Albumin, PL, NMR and IR.

Introduction

Carbon Nano tubes are allotropes of carbon with a Nano structure that can have a length to diameter ratio of up to 28,000,000:1 which is significantly larger than any other materials. The optical properties of carbon nanotubes are highly relevant for materials science. The way those materials interact with electromagnetic radiation is unique in many respects, as evidenced by their peculiar absorption, photoluminescence (fluorescence), and Raman spectra. Carbon nanotubes are unique "one-dimensional" materials, whose hollow tubes have a unique and highly ordered atomic and electronic structure, and can be made in a wide range of dimension. The diameter typically varies from 0.4 to 40 nm. However, the length can reach 55.5 cm, implying a length-to-diameter ratio as high as 132,000,000:1; which is unequalled by any other material.

Applications of carbon nanotubes in optics and photonics are still less developed than in other fields. Some properties that may lead to practical use include tenability and wavelength selectivity. Potential applications that have been demonstrated include light emitting diodes (LEDs), bolometers and optoelectronic memory.

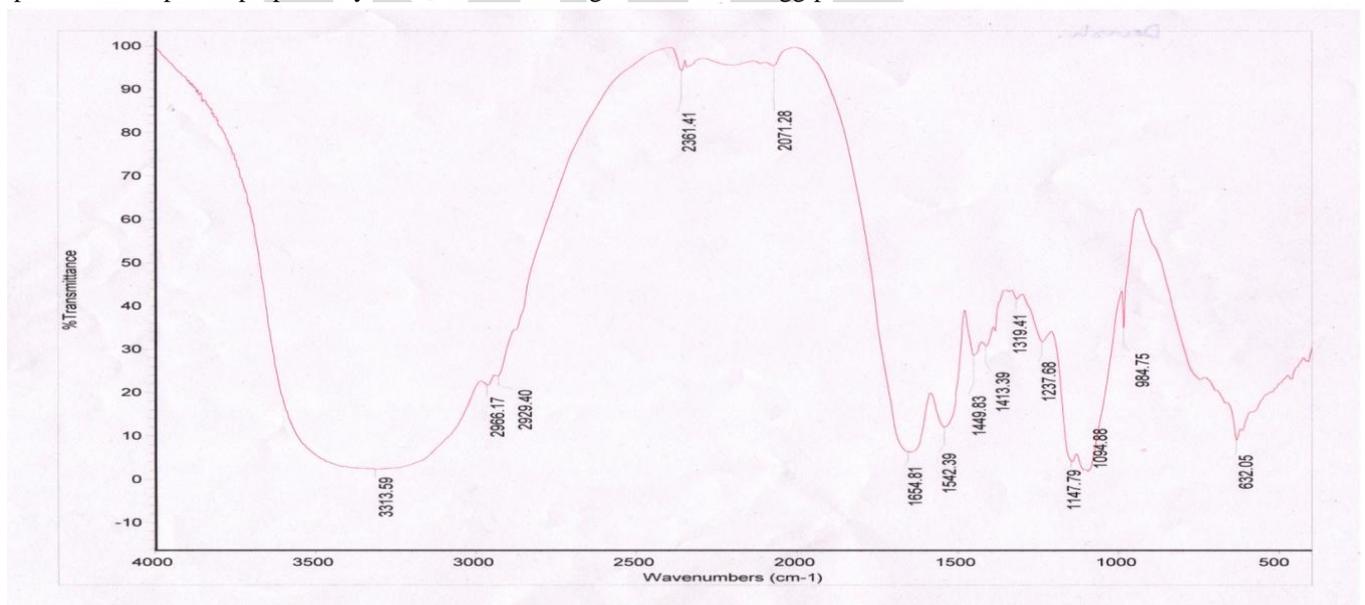
Chemical Experiment of Metal CNTs

Metal (Mn^{++}) salt solution of using AR grade Chemicals react with amino acid which is present in Egg Albumin and to form a complex Manganese metal albumin. This complex metal albumin is decomposed at high temperature and to form metal CNTs which is more applicable than general.

Characterization

Manganese Metal CNTs are characterized and result as follows by IR, NMR and PL.

- (a) **IR spectroscopy** deals with the infrared region of the electromagnetic spectrum. Electromagnetic radiations, having longer wavelength and lower frequency than visible light are involved. It covers a range of techniques, generally based on absorption spectroscopy. This spectroscopic techniques, is used to identify and study of chemical compounds. The IR spectra of compound prepared by the reaction of Manganese salt and Egg protein in alcoholic medium is shown below:



(b) IR Spectra of Manganese salt and egg protein in alcoholic medium.

Functional Groups	Prominent absorption band (cm ⁻¹)
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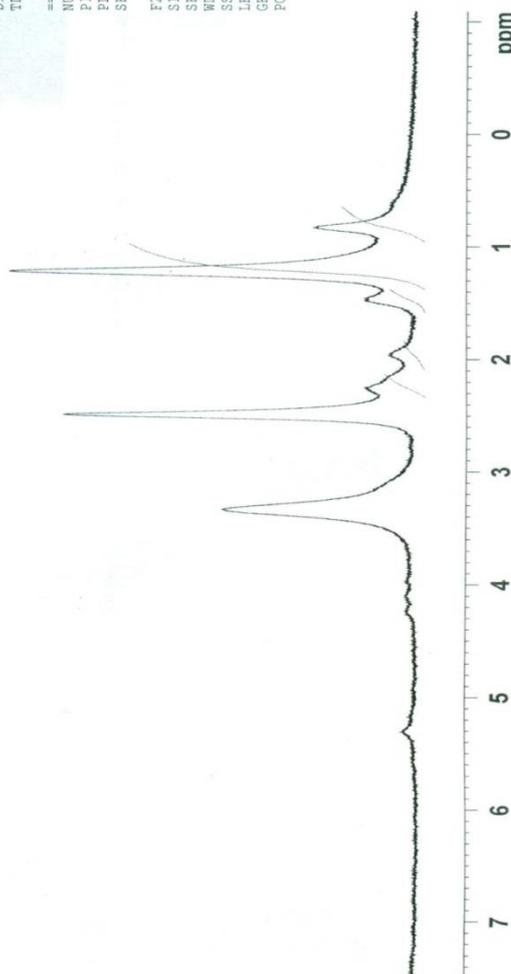
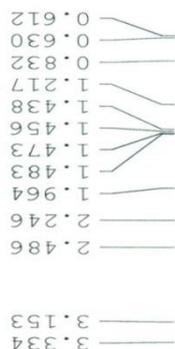
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LB 0.30 Hz
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PC 1.00
    
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MEWAT DEEP INST HARI BP Yellow

C-H (alkanes)	1147.79
Alcohol (hydrogen bonded)	3313.59
C-H	2966.17
Carboxylic acid (hydrogen bonded)	2929.40
Carboxylic acid	1654.81
Amide	1542.39
C-O Carboxylic acid	1094.88

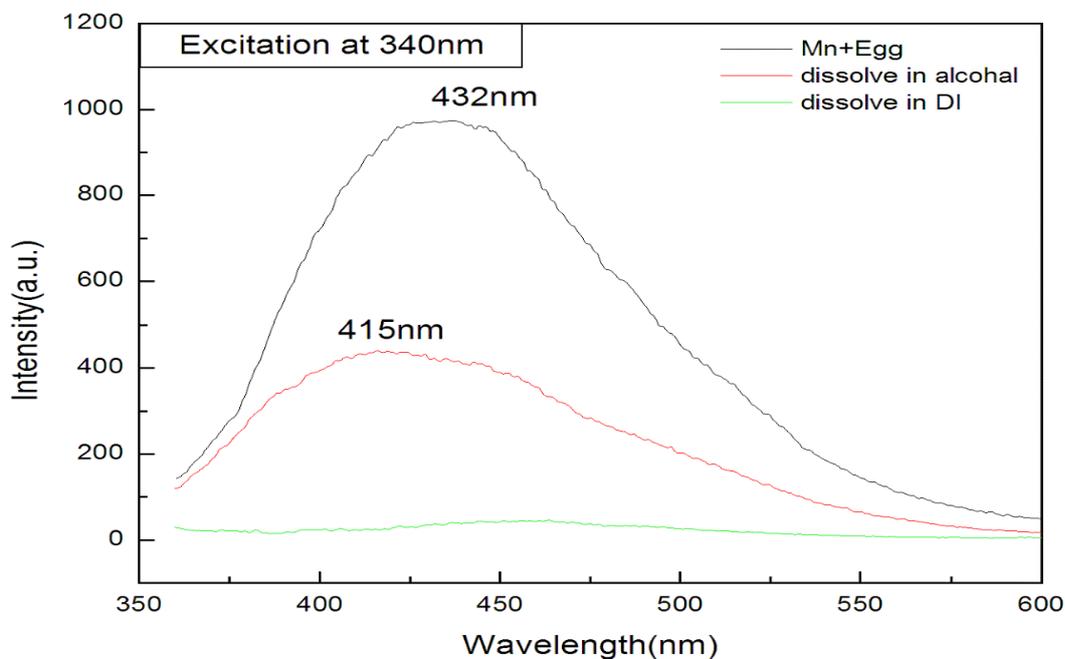
(b.) Nuclear magnetic resonance spectroscopy (NMR), is a technique that exploits the magnetic properties of certain atomic nuclei and determines physical and chemical properties of atoms or the molecules in which they are contained in complex

compound. Nuclear magnetic resonance provides information in detail about the structure, dynamics, reaction state, and chemical environment of molecules.

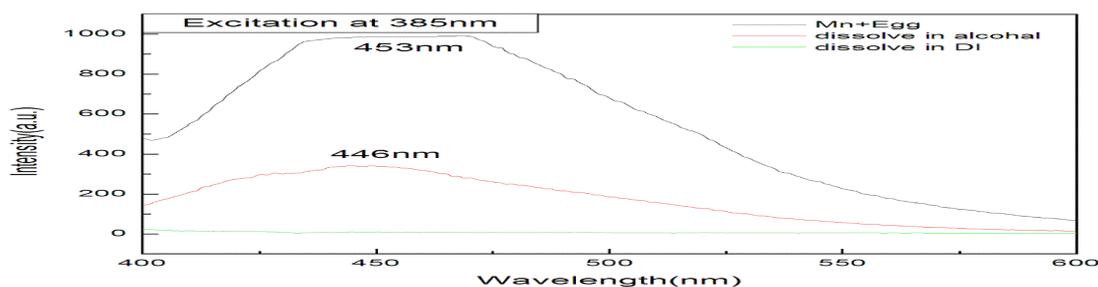
The information from above figure which we get by NMR spectra is summed and the Characteristics Proton Shift in the given table are as follows.

Types of Protons	Chemical Shift (ppm)
$(\text{CH}_2)_3\text{CH}$	1.00
CH_2-	1.17
$-\text{CH}-$	2.37
$-\text{CH}-\text{COOH}$	8.36

(C.) **Photo Luminescence (PL)**, Light is directed onto a sample, where it is absorbed and imparts excess energy into the material/CNTs. Photoluminescence excitation spectroscopy can be used to identify the chirality of carbon nanotubes.



From above figure if Excitation at 340 nm, the Intensity picks are 432 nm of Mn+Egg albumin and Intensity is 415nm when CNTs dissolve in alcohol.



From above figure if Excitation at 385 nm, the Intensity picks are 453 nm of Mn+Egg albumin and Intensity is 446nm when CNTs dissolve in alcohol.

Conclusion

Nano materials have extraordinary physical properties as a function of their size and shape due to strong quantum confinement effect and large surface volume ratio. Manganese Carbon nano tubes can be obtained by the reaction of aqueous solution of Manganese Salt with amino acids which are present in egg albumin after decomposing on high temperature of about 800°C to 1000°C.

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