ANALYSIS OF OPTICAL PROPERTIES OF PENTACENE THIN FILM

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ABSTRACT-In this paper the optical characteristics of pentacene thin film is analysed using UV spectrometer. The spectra of absorption, reflection and refraction of 250nm thickness thin film is studied. The study of wavelength and energy band gap shows the optical property of organic thin films and its use in the fabrication of displays.

***Keywords*- UV, pentacene, optical properties**

1. INTRODUCTION

Thin film transistor , displays ,high frequency rectifiers can be fabricated using organic semiconductor materials.. They shows high potential for the production of efficient devices. They can be used as active layers for different types of thin film transistor. They can also be used as optoelectronic devices.

In this study we used pentacene an aromatic hydrocarbon and its optical characteristics are measured first. It is a very promising material and the study of the optical properties may lead to electrical properties. . Pentacene thin film can be used for the fabrication of solar cells .We analysed the samples using UV and IR.

2. EXPERIMENT

In this experiment pentacene thin film is fabricated on a clean glass slide. The glass slide is cleaned using acetone and isopropanol..The glass slide is again placed in the ultrasonic bath and rinsed with pure water.The thin film of pentacene with thickness is fabricated on a glass slide using vacuum evaporation coating. The glass slide and the material is placed in the vacuum chamber with the proximity that the glass slide placed in the mean free path of material . Pentacene coated with thickness of 250nm on this glass substrate and studied the uv characteristics and analysed the absorption , reflection and refraction of the light falling on it.

3. RESULTS AND ANALYSIS

UV Analysis

Ultraviolet spectroscopy is used for the characterization of absorption, reflection and refraction of organic thin films coated on plane glass or organic thin film. The spectroscopy is a technique of measurement of light absorbed by the sample for given wavelength of light. The wavelength range here used is 190nm to 1000nm at room temperature.

a. absorption spectrum

Aborption spectroscopy is a technique used to measure the absorption of light as a function of wavelength and frequency from the radiating field N type π electrons or nonbonding electrons absorb visible or ultraviolet light energy and excite the electrons to the higher antibonding molecular orbits. The electrons jump from HOMO to LUMO can absorb light with longer wavelength and minimum energy needed to jump into vibrational level. The possible type of transitions is($\pi - \pi^*$, $n - \pi^*$, $\sigma - \sigma^*$, and $n - \sigma^*$) and they can be ordered as follows$\sigma - \sigma^* > n - \sigma^* > \pi - \pi^* > n - \pi^*$.

The fig.1 shows the variation of absorption of uv radiation with wavelength. The absorption is maximum at around 500m and reaches to zero after 700nm. Fig.3 explains the normalized uv-v graph of powder and solution type materials. The change in absorption is due to the change in the property of the medium when adding water.

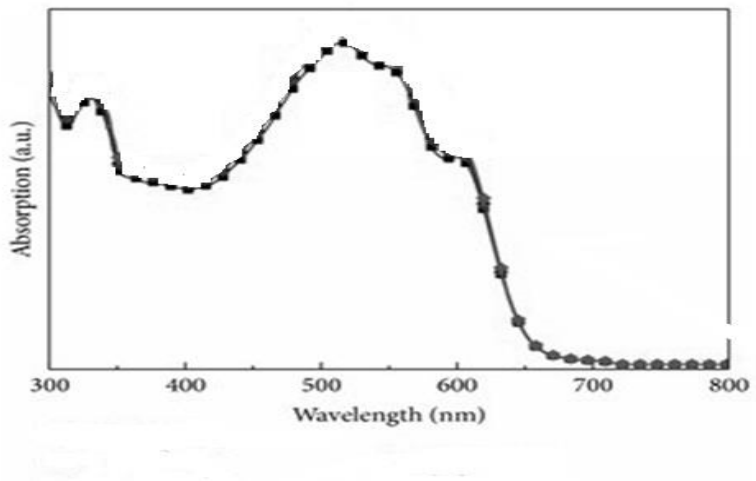

Fig.1

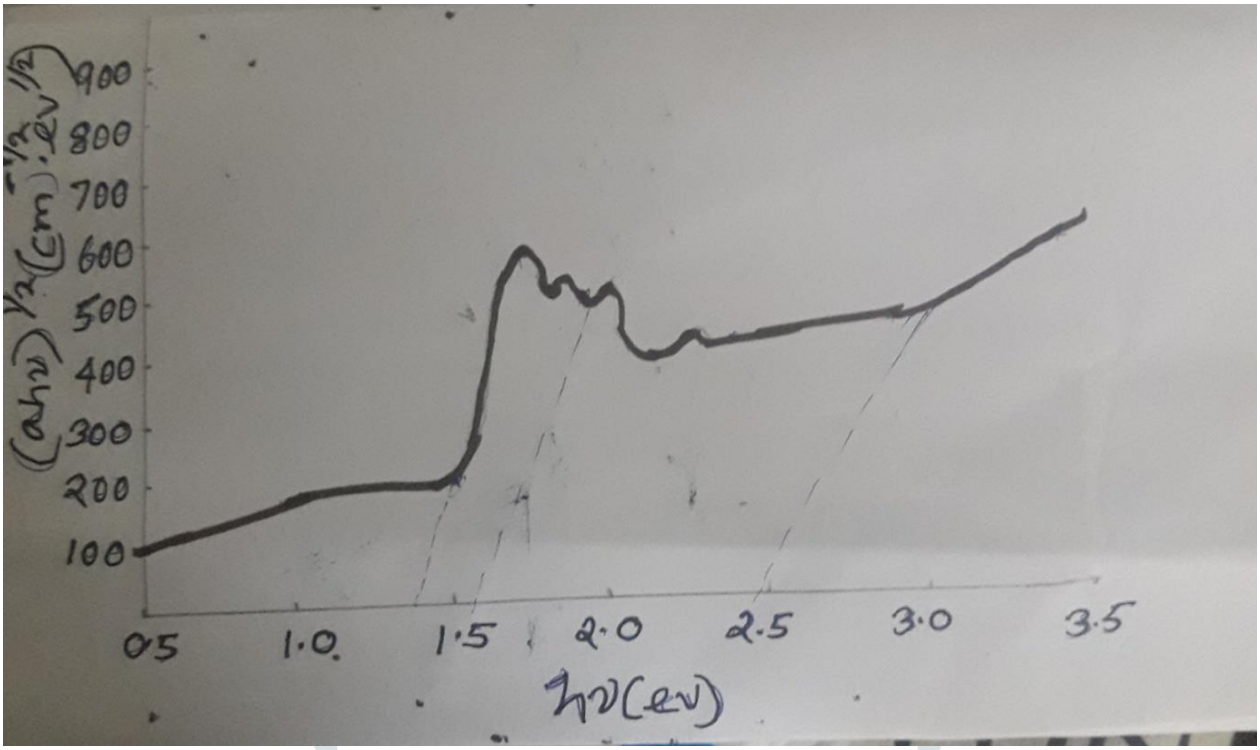
900
800
700
600
500
400
300
200
100
0·5
1·0
1·5
2·0
2·5
3·0
3·5
hν(eV)

Fig.2

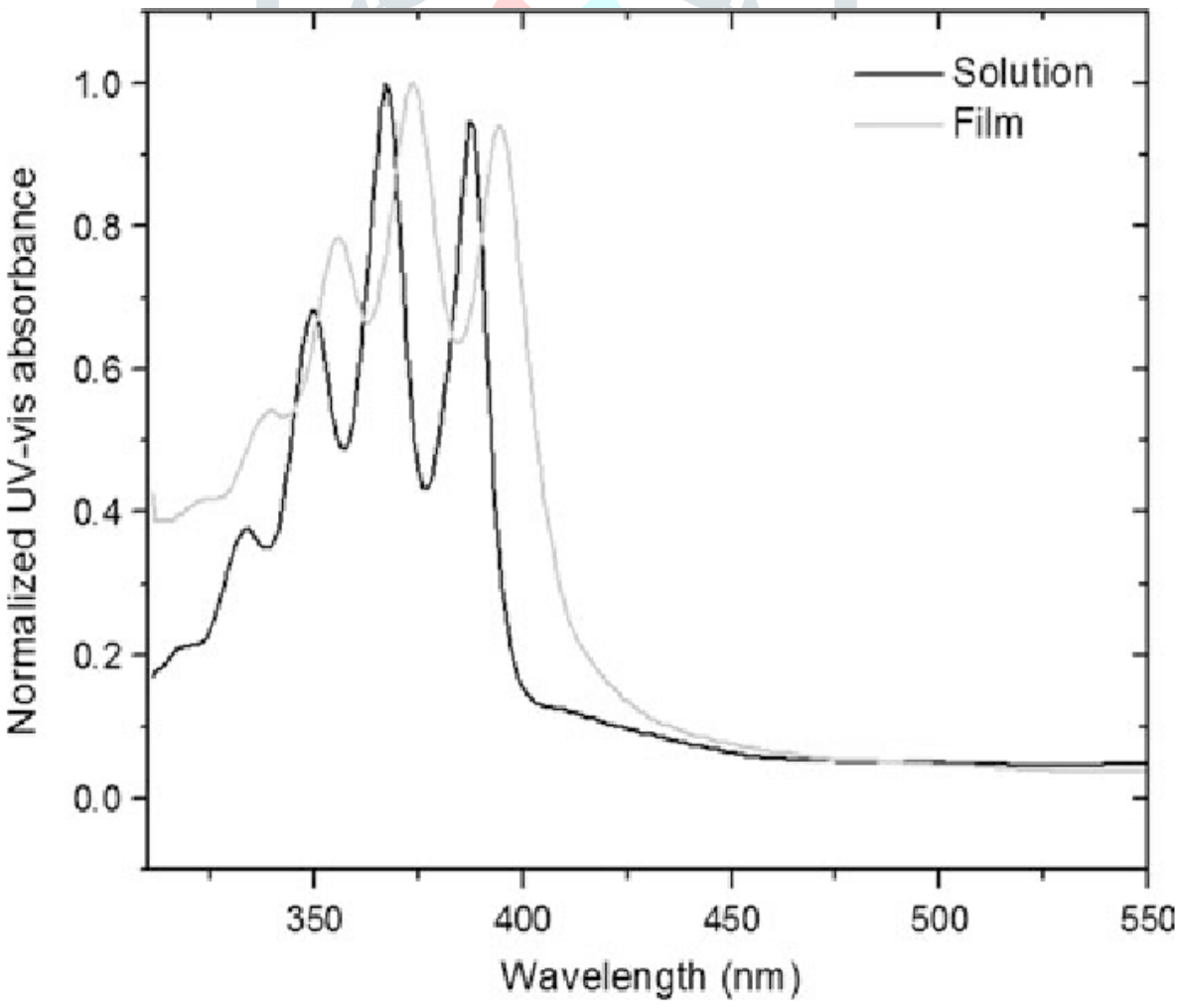
Solution
Film
Normalized UV-vis absorbance
1.0
0.8
0.6
0.4
0.2
0.0
350
400
450
500
550
Wavelength (nm)

Fig.3

b. Reflection spectrum

Spectrum of rough samples and powders can be analysed by using this type of diffuse reflection technology. Diffuse reflection is the reflection of a wave from a surface such that it is scattered at many angles instead of calculating only one reflected ray on the surface. In the figure.4 the reflectivity slightly increases and reaches maximum above 700nm.

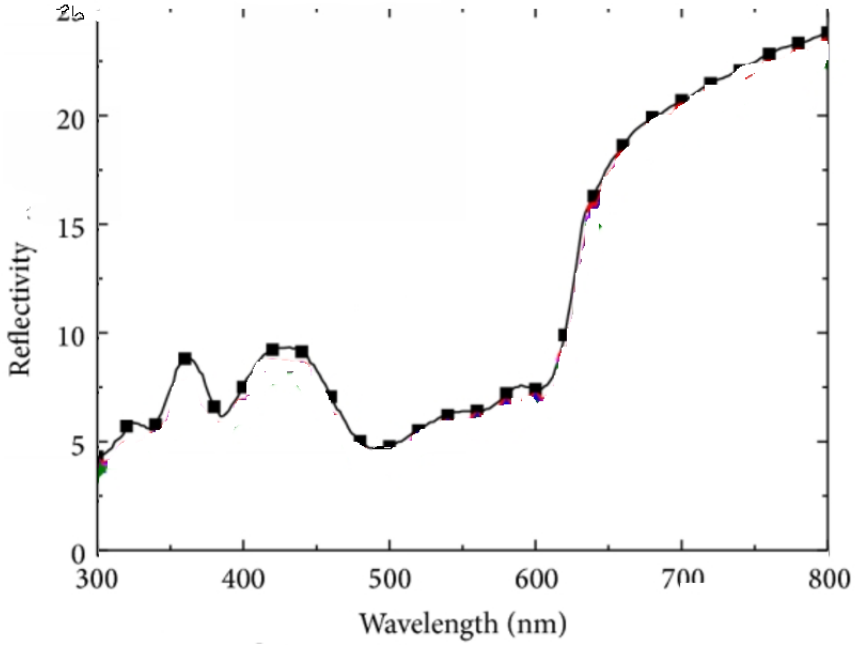

Fig.4

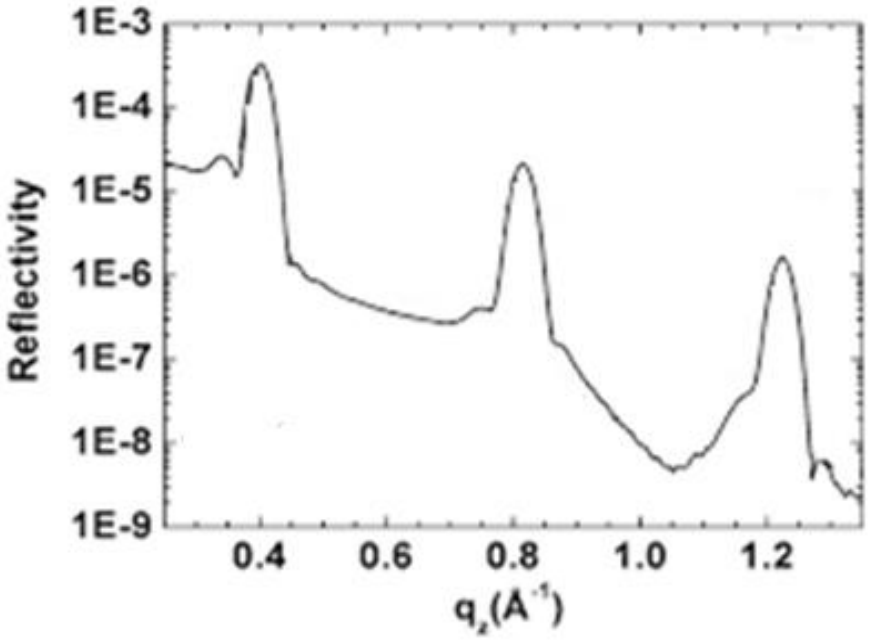

Fig.5

b. Refraction spectrum

Refraction is the change in direction of the light when the medium of transmission is changed. Refractive index is the ratio of speed of light in vacuum to that in the second medium . Absorption coeffient is the measure of the attenuation caused by absorption of energy per distance that occurs in the uv wave of particular wavelength propagating through a material medium of given refractive index. The value of absorption index.

$$K' = k\lambda/4\pi n$$

where K is the absorption coefficient, is the wavelength in vacuum, and n is the refractive index of the absorptive material medium.

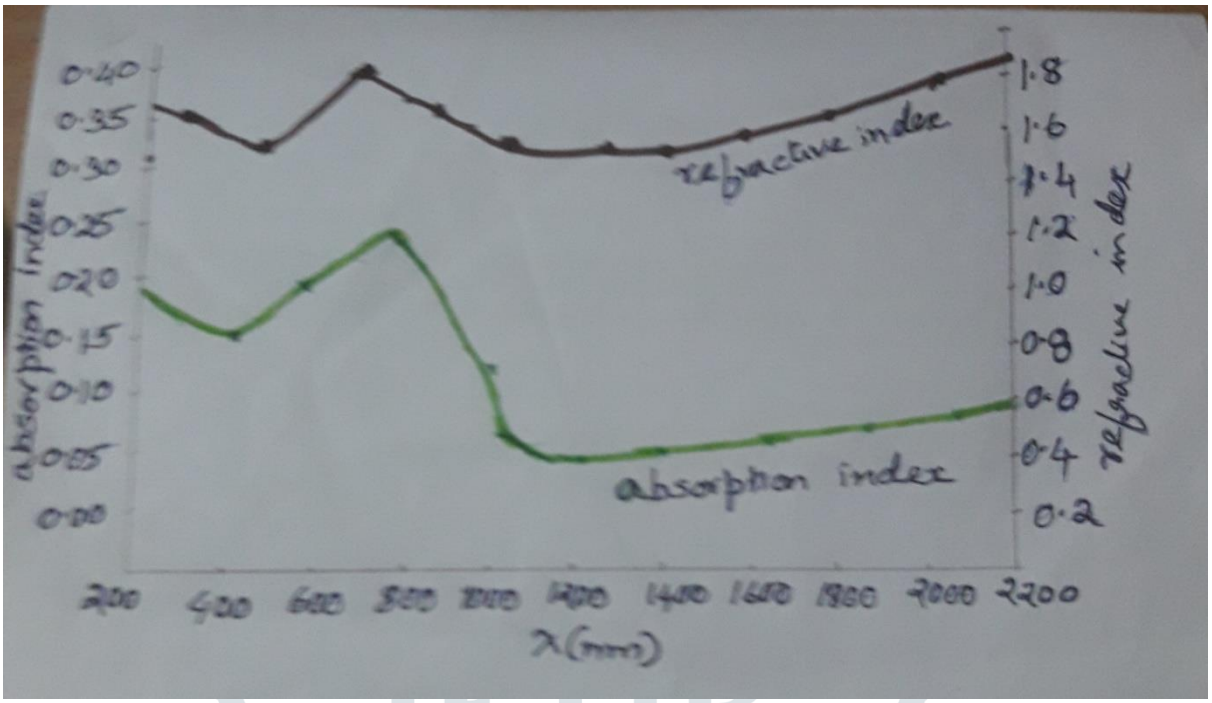

Fig.6

4. CONCLUSION

The optical properties like absorption, reflection and refraction of pentacene thin film according to the variation of wavelength of uv radiation is studied. The absorption index and refractive index with respect to different wavelengths are studied.

5. REFERANCES

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