Sudan University of Science & Technology
College of Postgraduate Studies

A study of the Optical properties of Propylene Doped with Aluminum Oxide

دراسة الخصائص البصرية للبروبلين المشوب بأكسيد الألمونيوم

A partial thesis submitted for the M.Sc. requirements in Physics

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الآيـــــة

قَالَ تَعَالَىٰ:

﴿ يَرْفَعِ ٱللَّهُ ٱلَّذِينَ ءَامَنُوا۟ مِنكُمْ وَٱلَّذِينَ أُوتُوا۟ ٱلْعِلْمَ دَرَجَٰتٍ ۚ وَٱللَّهُ
بِمَا تَعْمَلُونَ خَبِيرٌ ﴿١١﴾ ﴾

صدق الله العظيم

سورة المجادلة الآية(11)

الإهداء

الي روح أخي الذي افتقده بيننا

" احمد "

الى من بذل كل غالي وضحي من اجلنا

" أبي الغالي"

الي من سهرت ليالي واحتوتنا

ودعمتنا وقدمت كل ما تملك

"أمي الحنون "

الي رفيقة دربي وروحي

" اختي الحبيبة "

الي سندي في هذه الحياة

" اخواني"

الي كل من دعمني وساندني في حياتي ....

الشكر والعرفان

قف شامخا

عانق هناك الأنجما

يكفيك فخرا أن تكون

بين الناس

معلما

أقدم شكري لمن كان معي خطوة بخطوة

د. محمود حامد محمود حلو

د. عبد السخي سليمان

ملخص البحث

البروبلين من اهم العناصر في صناعة البتروكيماويات وتستخدم في نطاق واسع جدا من التطبيقات مثل التغليف والنسيج ومكبرات الصوت وأجزاء السيارات. يهدف هذا البحث الى دراسة الخصائص البصرية للبروبلين المشوب بأكسيد الالمونيوم وذلك باستخدام طريقة المحلول الجلاتيني والتي تعتبر من اهم الطرق والتقنيات التي ساهمت في تطوير دراسة أشباه الموصلات.

ان جميع الأجهزة الالكترونية اعتمدت اعتمادا كليا في عملها على مواد ذات خصائص فيزيائية وكيميائية خاصة بالمواد شبه الموصلة التي تمثل خواص العوازل عند درجة الحرارة المنخفضة ولها قابلية التوصيل عندما ترتفع درجة حرارتها لمدي معين

تم حساب معامل الامتصاص، وفجوة الطاقة ومعامل الانعكاس ومعامل الخمود ومعامل الانكسار، وثابت العزل الكهربائي.

من اهم النتائج التي تم التوصل اليها من خلال الدراسة ان فجوة الطاقة تقل بزيادة نسبة التشويب لأكسيد الالمونيوم ولكنها ضمن القيم المعقولة لفجوة الطاقة لأشباه الموصلات، ومعامل الامتصاص يقل بزيادة نسبة التشويب لأكسيد الألمونيوم، لذلك اما نقلل الألمنيوم او نشوب بمادة اخري لتعطي نتائج أفضل.

ونجد ايضا ان خاصية الانعكاسية حيث تزيد بزيادة نسبة التشويب ونستفيد منها في التطبيقات التي تتطلب انعكاسية عالية

Abstract

Propylene is a staple in the petrochemical industry and used in a very wide range of applications such as packaging, textiles, amplifiers, and automotive parts. This research aims to study the optical properties of doping impregnated propylene by using the gelatinous solution method, which is one of the most important methods and techniques that contributed to the development of the study of semiconductors.

All electronic devices are completely dependent in their work on materials with physical and chemical properties specific to semiconducting materials that represent the properties of insulators at low temperatures and have conductivity when their temperature rises for a certain range Absorption coefficient, power gap, reflection coefficient, dormancy factor, refractive index, and dielectric constant were calculated.

One of the most important results obtained through the study is that the energy gap increase with increasing the deformation ratio of doping and the absorption coefficient decreases with the increase of the denatured ratio of doping so underestimate ratio of doping the aluminum oxide.

Adding, reflection increase with increasing deformation ratio of doping and used in applications requiring that.

Chapter One

Introduction

1.1 Introduction

The study of optical properties is considered one of the most important scientific studies to find a type of materials with properties that can be used and contribute to the field of industry and the development of the industry such as the manufacture of polymers that are found in multiple applications in such as household appliances and building materials such as paint, packaging boxes, electrical and electronic equipment [1] Polymers are distinguished by a multiplicity of specifications. And its properties, whether hard, soft, transparent or opaque rubber, dielectric or electrically conductive, as propylene is an important polymer that can be used Including in the composition of materials that are similar in their properties to semiconductors and the study of their optical properties [2]. We will also learn about that in this paper, which denatured with corundum. Aluminum oxide is one of the oxides of industries close to semiconductors and linked to some polymers to obtain new materials by deformation, which is one of the important methods in material processing, where two materials are combine in a specific way in order to obtain materials of high specifications [3]

This research aims also to go through the information about aluminum oxide as polypropylene. Then, a laboratory study by the doping of the two materials includes study some optical properties {Absorbance-Transmission –Reflection - Absorption coefficient – Refractive index – the optical energy gap}.

The optical properties were studied through visible and ultra-violet wave length range (209-361) using UV-visible spectrometer, these properties were studied after the doping to five sample with certain ratio by sol-gel method and consider from very important of technical with contributed for developing study semiconductor.

1.2 Research problem

Polypropylene is one of the materials that used recently in multiple applications in the field of industry and electronics. Propylene is one of the available and cheap materials and is characterized by light weight, variety of properties, ease of formation and high hardness when it is in a state of solidity, and also has properties close to semiconductors (because it is an insulating material) and in conditions Specific turns into a semiconductor by deflection. As for deformation, it is an easy method and it can be performed anywhere with the lowest cost and there are no risks of working in this way compared to other methods.

1.3 Scope

This research comes into four chapters, in chapter one talks about introduction, Research problem, objectives, significance. In chapter two intended to theoretical background and materials used in this research (propylene- aluminum oxide), adding doping, sol gel method and some optical properties

Of matter. We relocate auto chapter three where give details about materials equipment, method and ultraviolet-visible spectrometer. Finally in chapter four contains discussion, optical results of

$(Al_2 O_3)_x (C_3H_6)_{1-x}$ samples, conclusion and reference.

1.4 Objectives

1.4.1 General objective

(A study of Optical properties of Propylene Doped with Aluminum

Oxide).

1.4.2 Specific objective:-

-Preparation five sample and studying optical properties.

-Ameliorate optical properties of propylene

-Knowing affecting of the doping of propylene at increases and decreases of aluminum oxide.

-Made new material of semiconductors.

Chapter Two

Theoretical Background

2.1 Propylene

Praline is a colorless gas with faint petroleum like odor. It is shipped as liquefied gas under its own vapor pressure. For transportation it may be stanched. Contact with the liquid can cause frostbite. It is easily ingnited. The vapors are heavier than air. Any leak can either be liuguid or vapor. it can asphyxiate by the displacement of air. Under prolonged exposure to fire or intense heat the containers may rupture violently and rocket . it is used to make other chemicals . cancuse explosion. Propene is an alkene that is propane with adouble bond position 1 .it has a role as a refrigerant and a xenobiotic . it is an alkene and a gas molecular entity.[1]

Properties

- Chemical formula: C_3 h_6
- Molar mass: 42.081 g\mol
- Appearance: Colorless gas
- Density: 1.745 kg\m3 []

2.2 Aluminum oxide

Aluminum oxide is a chemical compound of aluminum and oxygen with the chemical formula Al2O3 .it is the most commonly occurring of several aluminum oxide , and specifically identified as aluminum (III) oxide .it is commonly called alumina and may also be called aloxide ,alxite, or alundum depending on particular forms or applications. It occurs naturally in its crystalline polymorphic phase a.AL2O3 as the mineral corundum, varieties of which form the precious gemstones ruby and sapphire. Al2O3 is significant in its use to produce aluminum metal, as an abrasive owing to its hardness, and as a refractory material owing to its high melting point.[1]

Properties:

- Chemical formula: AL2O3
- Molar mass: 101.960 g\mol
- Appearance: white solid
- Odor: odorless
- Density: 3.987 g\cm3

2.3 Doping

In semiconductor production, doping is the intentional introduction of impurities into an intrinsic semiconductor for the purpose of modulating its electrical, optical and structural properties. The doped material is referred to as an extrinsic semiconductor .A semiconductor doped to such high levels that it acts more like a conductor than a semiconductor is referred to as a degenerate semiconductor. In the context of phosphors and scintillators, doping is better known as activation. Doping is also used to control the color in some pigments [2]

2.3.1 Techniques of doping and synthesis

Gas containing the negative dopant is passed over the negative is passed over the substrate wafer. In the case of n-type GaAs doping, hydrogen sulfide is passed over the gallium arsenide, and sulfur in incorporated into the structure. This process is characterized by a constant concentration of semiconductors in general, only a very thin layer of the wafer needs to be doped in order to obtain the desired electronic properties. The reaction conditions typically range 600 to 800 C for the n-doping with group VI elements and the time is typically 6-12 hours depending on the temperature [3]

2.3.2 Process

Some dopants are added as the (usually silicon) boule is grown, giving each wafer an almost uniform initial doping. To define circuit elements, selected areas – typically controlled by photolithography _ are further doped by such process as diffusion and ion implantation, the latter method being more popular in large production runs because of increased controllability.

Small number of dopant atoms can change the ability of semiconductor to conduct electricity. When on the order of one dopant atom is added per 100 million atoms, the doping is said to be low or light. when many more doping is referred to as high or heavy.this is often shown as n+ for n-type doping or p+ for p-type doping [3]

2.4 Sol –Gel method

The sol-gel synthetic technique is used to fabricate a porous structure composed of transition metal alkoxides. These structures most commonly utilize a siloxane (si-o) to form the backbone structure.

The synthesis of these sol-gels involves a hydrolysis of a silicone monomer followed by the condensation of the silica into a porous structure with a three-dimensional networked structure. The physical structures of these sol-gels can be tailored to produce structures with range of useful properties and the chemical surface chemistry can be modified to produce various surface interactions. [5].

2.5 Optical properties of matter

The optical properties of a material define how it interacts of light.The optical properties of matter are studied optical physics,a subfield of optics. [4] The optical properties of matter include

A basic distinction is between isotropic materials, which exhibit the same properties regardless of the direction of the light, and anisotropic ones, which exhibit different properties when light passes through them in different directions. The optical properties of matter can lead to a variety of interesting optical phenomena.

2.5.1 Absorbance

In optics, absorbance of decade absorbance is the common logarithm of the ratio of incident to transmitted radiant power through a material, and spectral absorbance or spectral decade absorbance is the common logarithm of the ratio of incident to transmitted spectral radiant power through a material. Absorbance is dimensionless, and in particular is not a length, through it is a monotonically increasing function of path length, and approaches zero as the path length approaches zero. The use of the term "optical density" for absorbance is discouraged. In physics,a closely related quantity called "optical depth " is used instead of absorbance : the natural logarithm of the incident to transmitted radiant power through a material. The optical depth equals the absorbance times in (10).

The term absorption refers to the physical process of absorbing light .while absorbance does not always measure absorption: it measures attenuation (of transmitted radiant power) . Attenuation can be caused by absorption, but also reflection, scattering, and other physical processes.

2.5.2 Reflection

Reflection is the change in direction of a wave front at an interface between two different media so that the wave front returns into the medium from which it originated. Common examples include the reflection of light, sound and water waves. The law of reflection says that for specular reflection the angle at which the wave is incident on the surface equals the angle at which it is reflected .mirrors exhibit specular reflection.

2.5.3 Reflection of light

Reflection of light is either specular (mirror-like) or diffuse (retaining the energy, but losing the image) depending on the nature of the interface. In specular reflection the phase of the reflected waves depends on the choice of the origin of coordinates, but the relative phase between S and P (TE and TM) polarizations is fixed by the properties of the media and of the interface between them. A mirror provides the most common model for specular light reflection, and typically consists of a glass sheet with a metallic coating where the significant reflection occurs.

Reflection is metals by suppression of wave propagation beyond their skin depths. Reflection also occurs at the surface of transparent media, such water or glass.

2.5.4 The absorption coefficient

Determines how far into a material light of a particular wavelength can penetrate before it is absorbed .in material with a low absorption coefficient, light is only poorly absorbed, and if the material is thin enough, it will appear transparent to that wavelength.

2.5.5 Extinction coefficient

Refers to several different measures of the absorption of light in a medium

- Attenuation coefficient, sometimes called "extinction coefficient" in meteorology or climatology mass extinction coefficient, how strongly a substance absorbs light at a given wavelength, per mass density. Molar extinction coefficient, how strongly a substance absorbs light at a given wavelength, per molar concentration.

Imaginary part of the complex index of refraction, in physics

2.5.6 The refractive index

In optics the refractive index of material is a dimensionless number that describes how fast light travels through the material.it is defined as

$$n = c \backslash v$$

Where c is speed of light in vacuum and v is the phase velocity of light in the medium. for example ,the refractive index of water is 1.333 ,meaning that light travels 1.333 times slower in water than in a vacuum. Increasing the refractive index corresponds to decreasing the speed of light in the material.

2.5.7 The optical band gap

The optical band gap determines what portion of the solar spectrum a photovoltaic cell absorbs. A semiconductor will not absorb photons of energy less than the band gap ; and the energy of the electron-hole pair produced by a photon is equal to the band gap .

What is importance of energy gap in semiconductor?

It is the energy which required for the promotion of a valence electron that bound to an atom which become a " conduction electron", that is free for moving within the "crystal lattice " and it also serves as the " charge carrier " to the conduct of electric current.

How is optical band gap measured?

The direct optical band gap of semiconductors is traditionally measured by extrapolating the linear region of the square of the absorption curve to the x-axis, and a variation of this method, developed by Tauc, has also been widely used

2.6 Previous studies

Zuheer Naji majeed , Abdul majeed Iyada Ibraheem, and Suzan Abdullah Hasan (2011) studied the effect of Annealing and doping by 10% cupper on some optical properties of (Zn S) thin films (energy gap, absorption coefficient, extinction coefficient) as a function of photon energy. The optical properties studied through visible and ultra-violet wavelength range (300-900) using UV-visible spectrometer; these properties were studied before and doping. It found that the energy gap was (3.6 eV) before annealing and doping but after annealing and doping it found that respectively. Absorption and extinction coefficient increased after annealing The Annealing and Doping on Some optical properties of (ZnS).

In other report studied Adel Khalil Mahmoud, Ferial Kadeem and Abbas Hessen Tasha , thin films of (Zno) film have been prepared by using the rapid thermal oxidation technique (RTOS) by using (hot plate) at temperature in (573) to investigated oxidation of evaporated spectra for prepared films in arrange of wave length (330_990nm).

The flowing optical properties have been calculated : the absorption coefficient, the forbidden energy gap for direct and indirect transitions, reflectance, extinction coefficient, refractive index, real and imaginary parts of electrical constant and the electrical conductivity.

Then Suma H.AL-Shaikh Hussein studied Epoxy plates have been made in the laboratory by mixing epoxy resin (A) with, hardener (B) in ratio (A:B) =(2:1) so they made (6) plates of different thickness about (0.95_5.8)mm.

The optical properties have been studied like (absorption, transmittance, reflectance, energy gap and fluorescent) also the optical constant were found including (absorption coefficient, extinction coefficient and refraction index) for all plates.

The results have shown that increasing the plates the absorption, intensity increase; at plates thickness(0.95_5.8) nm the absorption intensity were (0.20,0.69) respectively, and sine absorption peak for epoxy occur in ultraviolet region and exactly, at wavelength (330 nm) and energy gap (Eg=3.59(eV)); so the plates have transmittance about (60-92)% in visible region. The refraction index for Epoprimer epoxy in (n=1.3) and its reflectance is (20%) at wavelength (330 nm).

While the fluorescence spectrums that result from shifting absorption spectrum (stoke shift) for epoxy plates it differ according to the used plat's thickness. Where the shift increases toward longer wavelength the (red shift) with the increase in plates thickness as the result show; so at plate thickness of (0.95, 3, 5.8) nm the fluorescence spectrum shift was (100,131,140) nm respectively.

Experimental Details

3.1 Introduction

The optical properties of Aluminum oxide (Al_2O_3) and was sanded by UV spectrometer. The optical properties include absorption coefficient, refractive index,

3.2 Materials

The materials used in this work are Aluminum oxide (Al_2O_3). Some chemical catalysts were used

3.2.1Aluminum oxide

Aluminum oxide is an important salting agent in the nuclear solvent extraction. It is not extracted by TBP used as solvent in in PUREX, THOREX or interim-23 processes. For effective computer simulation, contribution of its density to the aqueous sub-system is required. Information on the thermodynamic parameters for aqueous solutions of aluminum oxide is severely limited. In this research, coefficients of density equation and apparent molar volume of aqueous solutions of aluminum oxide at 101.960 g/mol and 0.1 MPa will be reported.

3.2.2 Distilled Water

Water is indispensable for all forms of life. Experts agree that we need six to eight glasses of water per day to maintain optimum health. The daily cleansing of wastes from each cell, the flushing of the alimentary canal and the purifying of the blood are all-dependent on our drinking water. Our bodies lose water by various means – through the kidneys, through breathing and through perspiration. Without sufficient water, food cannot be properly digested, absorbed and carried to all parts of the blood stream. Waste-bearing water (urine) is necessary to flush away the end products of metabolism. Without water to moisten the surface of the lungs, there can be no intake of oxygen of expulsion of carbon dioxide.Distilled water is water which has been heated to the boiling point so that impurities are separated from the water which itself becomes vapor or steam. It is then condensed back into pure liquid form. The impurities remain in the residue, which is simply thrown away. Distilled water contains no solids, minerals or trace elements and has no taste. Distillation removes the debris, bacteria and other contaminants.

3.2.3 Hydrochloric Acid

Hydrochloric acid has many uses. It is used in the production of chlorides, fertilizers, and dyes, in electroplating, and in the photographic, textile, and rubber industries. Hydrochloric acid is corrosive to the eyes, skin, and mucous membranes. Acute (short-term) inhalation exposure may cause eye, nose, and respiratory tract irritation and inflammation and pulmonary edema in humans. Acute oral exposure may cause corrosion of the mucous membranes, esophagus, and stomach and dermal contact may produce severe burns, ulceration, and scarring in humans. Chronic (long-term) occupational exposure to hydrochloric acid has been reported to cause gastritis, chronic bronchitis, dermatitis, and photosensitization in workers. Prolonged exposure to low concentrations may also cause dental discoloration and erosion. EPA has not classified hydrochloric acid for carcinogenicity.

3.3 Equipment

Many equipment's were used in this work .Here we exhibit them

3.3.1 Method

The materials that were used in the experiment to prepare Aluminumoxide (Al_2O_3) is Aluminum nitrate Al $(NO_3)_2$. 9 H_2O, to prepare 0.1 M of Aluminumoxide, 5.25 g of aluminium nitrate was solved in 406 mL de-ionized water, and then added nitric acid (5 pH meter) to accelerate the reaction, for 60 min to made Aluminum Hydroxide .Then prepare 10.86 g of Pralinewas solve it on 747 mL deionized water and add with Aluminum Hydroxide that made in first prat of this step , and put the solution in the magnetic stirrer at 80^0C for 60 min. After that we were keep the samples at room temperature for 24 hour. Then drying the samples on the oven at 300^OC for the 120 min to give powder sample $(Al_2O_3)_{0.1}(C_3H_6)_{0.9}$ .Then prepare the other sample by formula $(Al_2O_3)_x(C_3H_6)_{1-x}$ where x be com (0.3,0.5,0.7 and 0.9).

3.3.2 Ultraviolet – visible spectrometer

The visible spectra obtained in shimadzo mini 1240 spectrophotometer scanning between 200 -1200 nm. The spectrophotometer measures how much of the light is absorbed by the sample .the intensity of light before e going into a certain sample is symbolized by Io. The intensity of light remaining after it had gone through the sample is symbolized by I. the fraction of light transmitted is (Io/I) which is usually expressed as percent transmittance (%T)from this information ,the absorbance of the sample is determined for that wavelength or as function for ranger of wavelength .sophisticated UV/visible spectrophotometers often do this automatically. Although the sample could be solid (or even gaseous, they are usually liquid).

A transparent cell, often called cavetti. It used to hold a liquid sample in spectrophotometer. The path length L through the sample is then the width of the cell through which the light passes through. Simple (economic) spectrophotometer may use cavetti shape like cylindrical test tubes, but more sophisticated one use rectangular cavity common 1cm in width for just visible spectroscopy, ordinary glass cavity may be used, but ultraviolet spectroscopy requires special cavities made of UV transparent materials such as quartz. An ultraviolet visible spectrum is essentially a graph of light absorbance vs. Wave length in arrange of ultraviolet or visible regions.

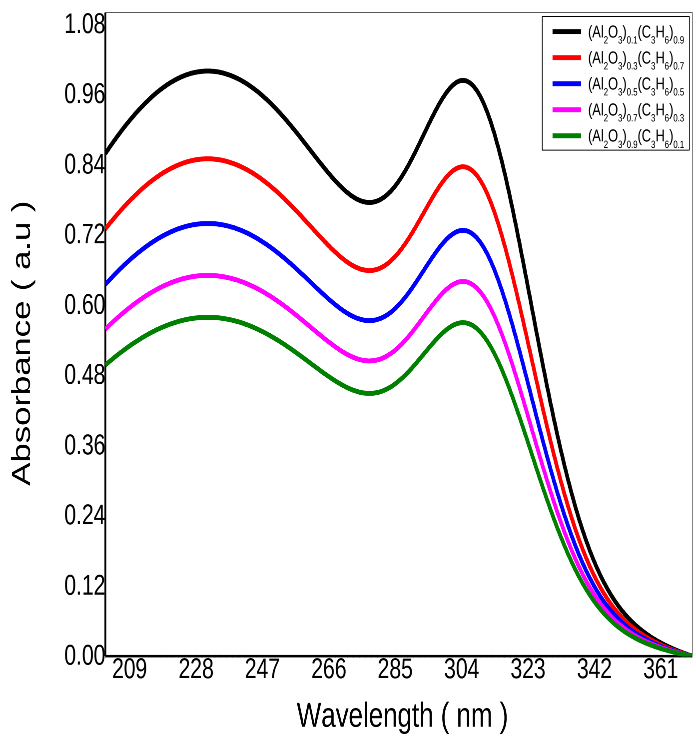
Chapter Four

Results and Discussion

4.1 Discussion

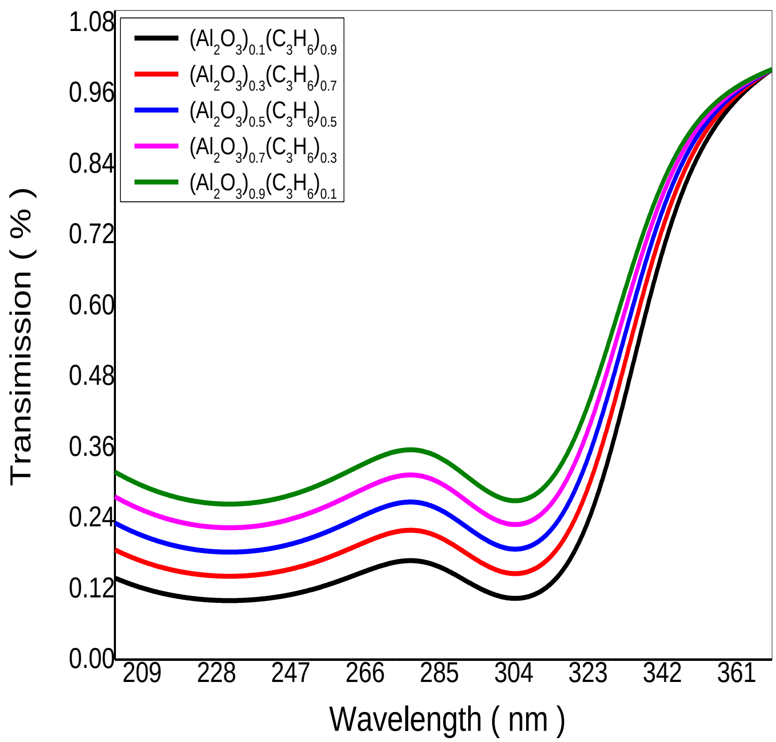
In this part of research, the main results that have been obtained from the experiments made of $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ where x = (0.1 ,0.3 ,0.5 ,0.7 and 0.9) are presented. The data of UV-visible used to evaluate the band gap and optical properties.

4.2 Optical Results of $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ samples



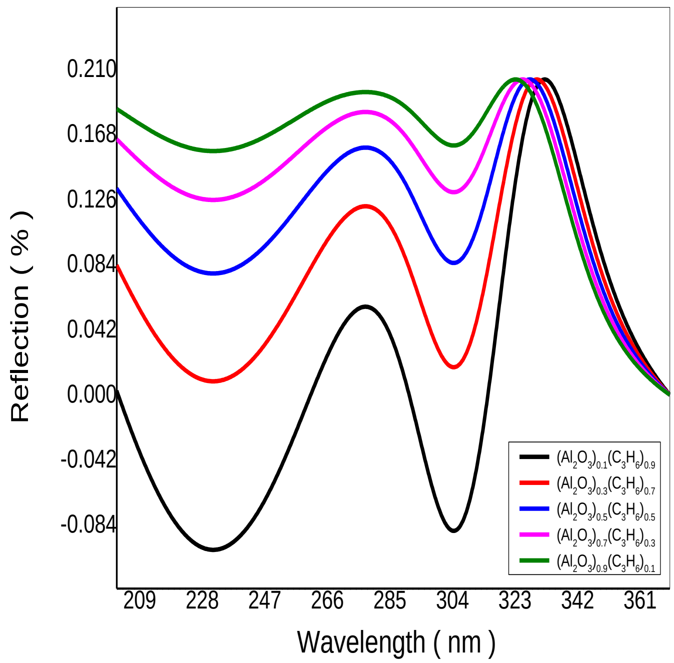
Fig[4.1]: The relation between absorbance and wavelengths of $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The absorbance behavior curves is found be the same for all five samples of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$ where x = (0.1 ,0.3 ,0.5 ,0.7 and 0.9). The study using UV-VS min 1240 spectrophotometer, Show all resolute of absorbance in Fig (4.1). It shows also the relation between absorbance and wavelengths for five samples of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$, the rapid decrease of the a absorption at wavelengths 305 nm crosponding to the photon energy 4.66 eV by increasing the index of (Al_2O_3), which mean that the complete absorbance is due to the ultrviolet range with a maximum value of 0.96 au (high apsorption) and that led to the possibility of using the samples as UV



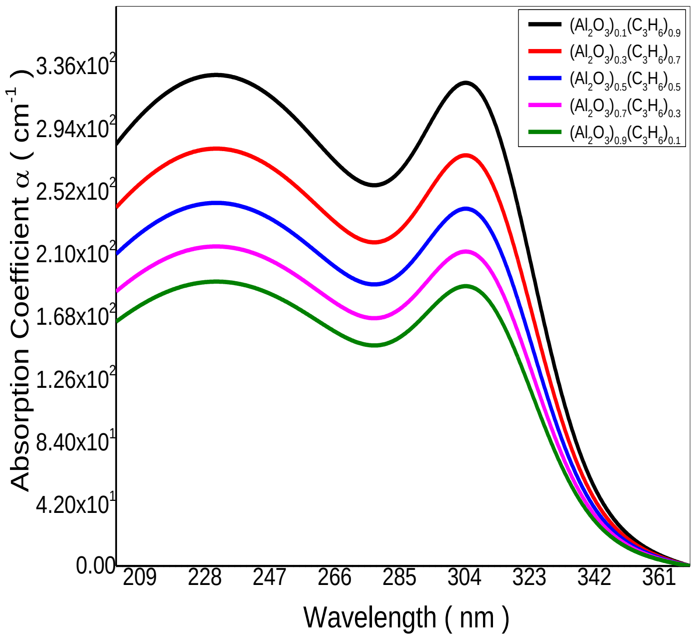
Fig[4.2]: The relation between transsimion and wavelengths of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The transmission behavior curves are found to be the same for the five samples of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9), as given in Fig (4.2). It shows that the relation between transmission and wavelengths for all five is direct proportional between transmittance the x index of (Al_2O_3), which mean that the complete transmittance is due to the ultrviolet range with a maximum value of 30 % (low transmittance).



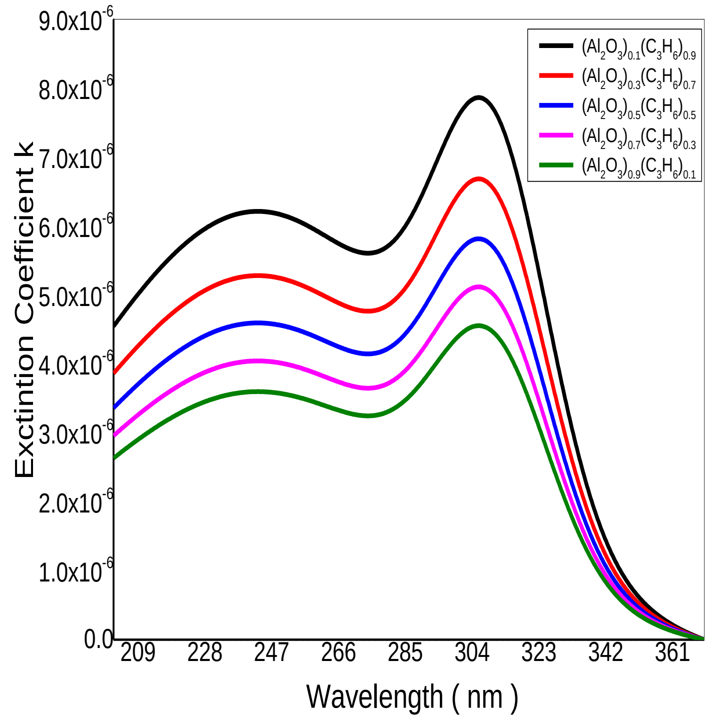
Fig[4.3]: The relation between reflection and wavelengths of $(Al_2O_3)_x(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The transmission behavior curves are found to be the same for five samples of $(Al_2O_3)_x(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9), It shows that the reflectance for all five samples has a maximum value of reflection in tow regions of wavelengths, the first one in ranged (260 to 290) nm, and the second ranged (320 to 335) nm, in the second region the samples become mirrors. The efficet of the doping x index of (Al_2O_3) on the refelectance is increasing the reflection in blue sheft in the second region, but in the first region increase in direct proportionality.



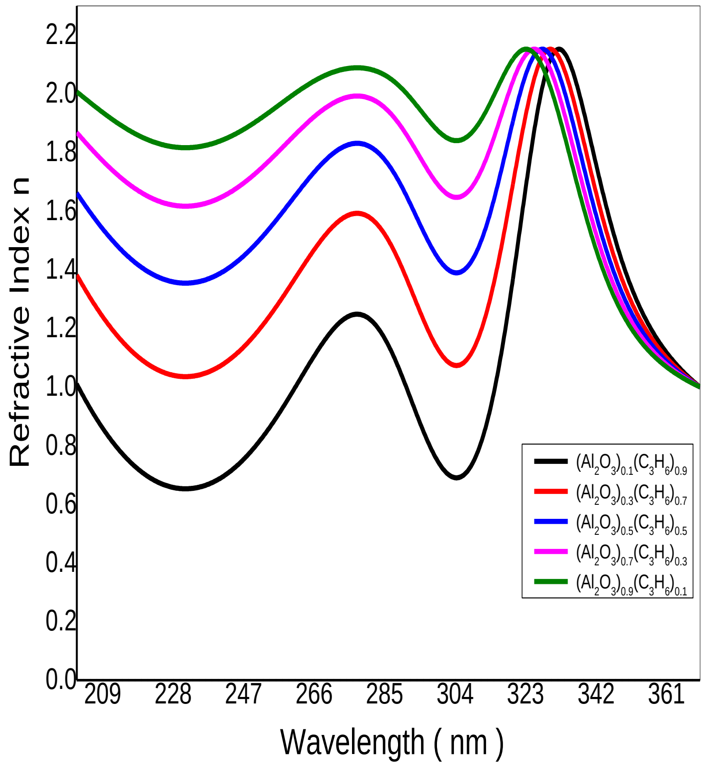
Fig[4.4]: The relation between absorption Coefficient and wavelengths of $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The absorption coefficient (α) of the five prepared sample by $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9) were found from the following relation $\alpha = \frac{2.303xA}{t}$ where (A) is the absorbance and (t) is the optical legth on the samples. Fig (4.4) shows the plot of (α) with wavelength (λ) of all five sample, which obtained that the value of $\alpha = 3.24x10^2$ cm^{-1} for $(Al_2O_3)_{0.1}$ $(C_3H_6)_{0.9}$ sample in the UV region (305 nm) but for $(Al_2O_3)_{0.9}$ $(C_3H_6)_{0.1}$sample equal $1.89x10^2$ cm^{-1} at the same wavelength, this means that the transition must corresponds to an indirect electronic transition, and the properties of this state are important since they are responsible for electrical conduction. Also, it shows that the value of (α) for all five samples decrease while x index of (Al_2O_3) increased .



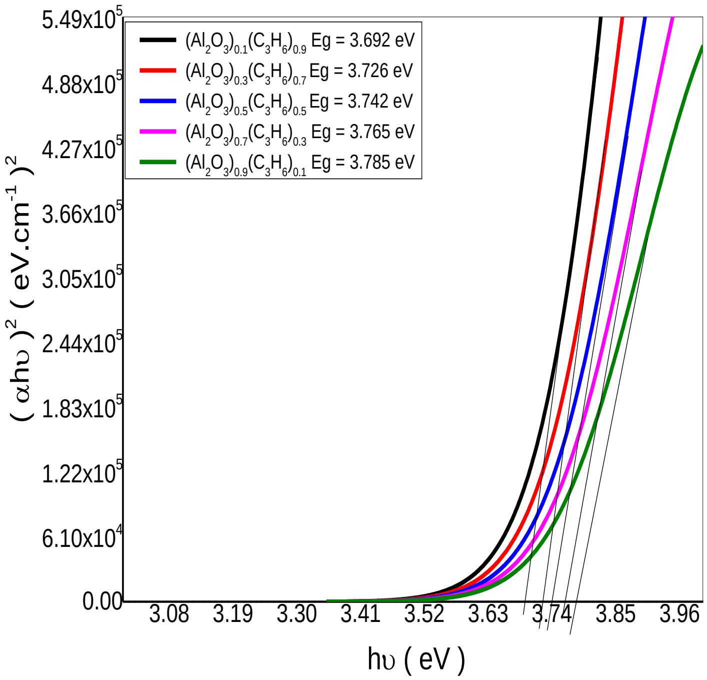
Fig[4.5]: The relation between exctintion Coefficient and wavelengths of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The Extinction coefficient (K) was calculated using the related $k = \frac{\alpha\lambda}{4\pi}$ The variation of the (K) values as a function of (λ) are shown in Fig (4.5) for fivet samples, and it is observed that the spectrum shape of (K) is the same shape of (α). The Extinction coefficient (K) for five samples of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9) as showing is obtained, the value of (K) at the (305 nm) wavelength was depend on the samples treatment method, where the value of (K) at 305 nm for $(Al_2O_3)_{0.1}$ ($C_3H_6)_{0.9}$ sample equal $7.9x10^{-6}$ while for other sample $(Al_2O_3)_{0.9}$ ($C_3H_6)_{0.1}$ at the some wavelength equal $4.5x10^{-6}$. the effect of doping rate by x index of (Al_2O_3) decreases the extinction coefficient (k).



Fig[4.6]: The relation between reflective index and wavelengths of $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The refractive index (n) was calculated from the equation $n = \left[\left(\frac{(1+R)}{(1-R)}\right)^2 - (1+k^2) \right]^{\frac{1}{2}} + \frac{(1+R)}{(1-R)}$ Where (R) is the reflectivity. The variation of (n) vs (λ) for all five samples was treated for the $(Al_2O_3)_x$ $(C_3H_6)_{1-x}$ samples where x = (0.1, 0.3, 0.5, 0.7 and 0.9). Fig.(4.6) Shows relation of the refractive index (n) spectra,which shows that the maximum value of (n) is (2.16) for all samples at two regions, the first one in ranged (260 to 290) nm, and the second ranged (320 to 335) nm, the efficet of doping rate index (x) of (Al_2O_3) increases the reflective index in the blue sheft region (second region), also in the first region, increasing index (x) of (Al_2O_3), increases the reflective index. It shows that the value of (n) begin to decrease befor 260 nm and after 335 nm of region spectrum .



Fig[4.7]: Optical Energy Band Gap of $(Al_2O_3)_x$ ($C_3H_6)_{1-x}$ samples where

x = (0.1, 0.3, 0.5, 0.7 and 0.9)

The optical energy gap (Eg) has been calculated via the relation $(\alpha h\upsilon)^2 = C(h\upsilon - Eg)$ where (C) is constant. By plotting (αhυ)2 vs the photon energy (hυ) as shown in fig.(4.6). For the five prepared samples. And by extra-polating the straight thin tangant of the curve to intercept the energy axis, the value of the energy gap has been calculated. In fig (4.7) the value of (Eg) $(Al_2O_3)_{0.1}$ ($C_3H_6)_{0.9}$ sample obtained was (3.692) eV while for sample $(Al_2O_3)_{0.9}$ ($C_3H_6)_{0.1}$ was (3.785) eV. The value of(Eg) was decreased from (3.785) eV to (3.692) eV. The decreasing of (Eg) related to increased of x index of (Al_2O_3) on the samples. It was observed that the different x index of (Al_2O_3) confirmed the reason for the band gap shifts.

4.3 conclussion

In this research, some optical properties of propylene doped by Aluminum oxide were studied, and the most important of these properties was the absorbance property, as it was found that the absorbance decreases with the increase in doping rate and this is a very good indicator as this property can be used in the manufacture of protective . It is also possible to make thin films and sheets. With specific thicknesses, it helps protect the system from pressure, humidity, chemicals and corrosion. It can also be colored and grafted on propylene and used in applied visual studies and in architectural processes such as decoration because they are in the form of beautiful crystals, and the top of the absorption spectrum is found to be at a ratio of 96%

The second feature of high importance is the energy gap, and we found that it decreases as the aluminum oxide rate increases, so we benefit from it in application terms in the manufacture of electrons, which depend on semiconductors.

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