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Preparation and Characterization of Optical Properties of Metal Organic Compounds

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Abstract: **This paper has to be included preparation of complex for Cr ion (III) chromium chloride and aqueous iron chloride (III) with Schiff bases ligand (N, N) di methyl of the amino benzaldhyde . The prepared complexes were characterized by IR,UV and visible spectra . Also the optical properties in the region are visible in the wavelengths (200-400)nm and different concentrations dissolved in different concentrations dissolved with ethanol were studied , for the properties of optical include the absorbance and turbidity and refractive index from the polarization ' the reflectance , coefficient of finesse , critical angle and the angle of brewster , The results shows that the properties increase with increase concentration except the critical angle which directly proportional the concentration and all the results are compared with similar compounds .**

Keywords: **turbidity, critical, finesse, metal.**

1. INTRODUCTION

Schiff bases are compounds having a formula RR'C=NR'' where (R) is an aryl group, R' is a hydrogen atom and R" iseither an alkyl or aryl group1. However, typically compounds where R" is an alkyl or aryl group and R' is an alkyl or aromatic group are also counted as Schiff bases class is very versatile as compounds can have a variety of different substituents and they can be unbridged or N, N bridged. Most commonly schiff bases have NO or N2O2 -donor atoms but the oxygen atoms can be replaced by sulphur, nitrogen, or selenium atoms. In this study, attention was paid to the most common Schiff bases, especially to salen and salophen9 Complexes. Elajaily et.al. studied the antibacterial activities of the Schiff base derived from the salicylaldehyde and histidine and its Mn(II) ,Co(II) ,Ni(II) , Cu(II) and Cd(II)complexes on some pathogenic bacteria .The divalent metal ions of Co(II)' Ni(II)or Zn(II) have the formula of Ml2X2 and Ml2 in there complexes. The optical properties were studies for carboxy methyl cellulose polymer in which they repotted by (Al-Bermany K. J.2009) and all the Results showed that all properties increased with the increase of the concentration except the critical angle which was decrease with increase the concentration2. The present work aims to synthesis sample from Schiff bases complexes through of correction Schiff bases compounds and Study Some of Optical Properties3

Theoretical Part:

When light incidents on substance a number of reactions are triggered by of the interaction light beam with the material as it absorbs the photon, who works on the irritation of the molecules a lmutharh. The spectrum of ultraviolet and visible useful in the complexes characteral 'as it gives a distinctive absorption in the ultraviolet - visible as is useful in the diagnosis of complexes containing antioxidants (Amery, 2003). Material cause absorption of the rays falling active electronically may lead to the dissociation of their moleculars if the value of energy absorbed is greater than the value of the dissociation of one of the links or move to a higher energy level, since the probability of absorption increases with the concentration of the low energy level and increase the number of photons of light beam. The probability of photon absorption is directly proportional with the concentration of the absorbed molecules and the thickness of the model and onhe following (El-Sherbini '1982)4:

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$$\frac{dI}{I} = -KC_m\, dx \quad \text{..... (1)}$$

Where(I) is the of the incident light , and dI is the change in the light intensity produced by absorption in a thin layer of thickness dx and molar concentration Cm .which is obtained by integration equation above(El-Sherbini '1982):

$$\ln\frac{I}{I_0} = 2.303\log\frac{I}{I_0} = -KC_m L \quad \text{..... (2)}$$

Where (L) represents the optical path length . The appropriate use of the equation of Lambert - Beer in different spectral ranges such as ultraviolet, visible and infrared rays, etc. are required to guide the light is monochromatic(AL-Nasraoui'1998)5:

$$\log\frac{I}{I_0} = A = \alpha_{op} C_m L \quad \text{..... (3)}$$

Where (α) is referred to as the light absorption coefficient (A) absorbance.

Was measured refractive index as the ratio between the speed of light (c) to speed (v) in any medium specific and wavelength specific, and these measurements were calculated Polarizability (P) from the change in refractive index with concentration can be calculated Polarizability (Danial and Alberty' 1975)6: :

$$n^2 - n_0^2 = \frac{4\pi NP}{V} \quad \text{..... (4)}$$

where (N) represent the number of molecules in volume V' (n' n0) the refractive index of the solvent and solution respectively. (P) Polarizability and from refractive index a gradient with Molar concentration can be obtained on the Polarizability and on the following:

$$\mathbf{P} = \frac{(\mathbf{n}+\mathbf{n}_0)(\mathbf{n}-\mathbf{n}_0)\mathbf{V}}{4\pi\mathbf{N}} = \frac{\mathbf{N}_0}{4\pi}\left[\frac{\mathbf{dn}}{\mathbf{dc}}\right]\frac{\mathbf{M}}{\mathbf{N}_A} \quad \text{..... (5)}$$

As (M) molecular weight, (NA) number of Avkadro.

And then were calculated Reflectance (R) from the following relationship:

$$\mathbf{R} = \left[\frac{\mathbf{n}-1}{\mathbf{n}+1}\right]^2 \quad \text{..... (6)}$$

$$\mathbf{F} = \frac{4\mathbf{R}}{(1-\mathbf{R})^2} \quad \text{..... (7)}$$

Is defined as the fraction of reflected light energy to light energy incident.

And also the calculated coefficient of of fineness (F) is defined as a measure of the sharpness of the interference fringes of the relationship (Grant'1975)7).The critical angle calculated by the following relationship (1981, Francis A. Jenkins and Harvey E. Hoain)8:

$$\theta_c = \mathrm{Sin}^{-1}(1/\mathrm{n}) \quad \textbf{..... (8)}$$

As well as the possible calculation Brewster angle of relationship following (Sears' 1964)9,10:

$$\theta_B = \tan^{-1}(n) \quad \text{..... (9)}$$

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2. EXPERIMENTAL PART

i. Synthesis of Schiff Base Ligand11 :

The method of preparation was as follows:

The *4*-amino antipyrine (5 g, 0.014 mol) dissolved with 4-dimethylamino benzaldehyde (3.6 g, 0.024 mol) in ethanol (40 ml). Five drops of glacial acetic acid added to the solution and the mixture was refluxed for (1.5 hr). The Schiff base ligand was isolated after the volume of the mixture was reduction to half by evaporation and the obtained product was collected by filtration washed several times with ethanol and recrystilized by absolute ethanol. The melting point of the yellow crystals found to be (219oC). The yield was (99.99%).

ii. Preparation of Schiff base complexes:

The mixtures of the Schiff base under investigation (3.34g ,0.01mol) in 30 ml ethanol and metal salts [1.29g, NiCl2(0.01mol) ‘ CrCl3.6H2O(2.66g) , FeCl3(0.8g)] in the same amount of the same solvent were refluxed for two hours ,The complexes were collected by filtration and then washed several times with ethanol. The resulted products were dried in air and stored. Scheme1 .

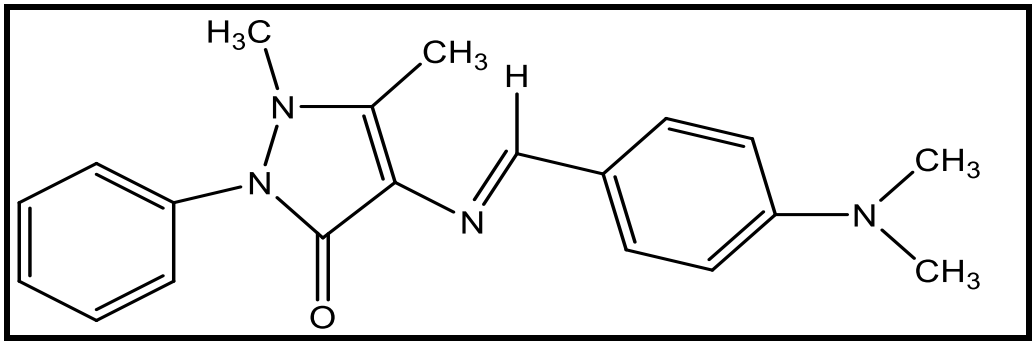


Fig:1 Structural formula of the ligand(free material)

Been characterization compound under study mediated by spectroscopic techniques available as infrared (IR) spectra and ultraviolet and visible (UV-Vis) of the compound dissolved in ethyl Procedure.Different weights of the base Schiff complexes were prepared in range (0.3-0.1) were dissolved in the volume of (25) ml of absolute ethanol to obtain different concentrations ranging from (0.002-0.014) mol / l and where was the use of your rotary engine to speed up the process of melting and homogenization solution was measured optical properties of the solvents at a temperature laboratory.Absorbance was measured through a device (Spectrophotometer) which reported values of absorbance and turbidity according to the change of concentration. It was also measured the refractive index of all solutions and temperature laboratory (27oC)-mediated device (Abbe refracto meter) Made in West Germany were calibrated and the water distilled to obtain the standard value of refractive index (1.334) was compared with the value of the refractive index of water distilled at the same temperature is (1.335) and that the error rate was (± 0.001) was so taken into account in all measurements. The measurements of the refractive index was calculated polarizability and reflectance , coefficient of of fineness, critical angle, Brewster angle.

3. RESULTS AND DISCUSSION

It is clear from comparing the spectrum of the (IR) of this complex with ligand spectrum they observed differ, the new packages were not already present in the spectrum of ligand while suffered other packages from the obvious changes in shape, intensity and location. The reason for this is to get the consistency between the metal ions and free material. Has been benefiting from the results of measurements of UV and (UV-Vis) spectra to see the transfer of electronic to these complexes is attributed these packages to the state of excitement topical for benzene ring because for absorption of the groups (C = N), (C = C), (CH), (MN) resulting in general for transitions (n-π*), (π-π*) is expected to be packaged

absorption at wavelengths higher back for the transition (n-π*) of the azomethine group effective (C=N) donor of the electrons12. Available as an electronic pair not bounded is the nitrogen atom in which can be shared in the process of moving mail . Were measured absorbance of the concentrations of all the temperature of the lab and figure (2) represents the spectra of absorbance of the form ligand (article free) and nickel bivalent (II) 'chromium aqueous trivalent (III), iron trivalent (III) complexes respectively in the range of wavelengths of the ultraviolet and visible where we note increasing the amount of absorbance increase concentration of the compound (a) and nickel (II) (b) chromium aqueous (III), iron (III) complexes is due to the relationship directly between concentration and absorbance, according to the law of Lambert, as the highest value of the absorption appears at wavelengths nm (360) for a composite heat (a), peaking at a wavelength and was measured refractive index for practically all concentrations and the form (3) shows that the values of the refractive index increases linear increase with increasing molar concentration ligand and complex (a'c'd), respectively, and the reason for that is that when an increased concentration increases the value of density and that density is the important function to calculate the refractive index of the increasing the values of the refractive index increase concentration and this is similar to the obtained by the researcher (Samir Al-Nasraoui,1998).

As well as possible measurement values of turbidity for different concentrations and the form (4) shows the relationship between turbidity and concentration and by the shape note that the values of turbidity increases with increasing concentration and the reason for that, and that the case of turbidity college occurs when the solution is not fully Dissolving and that we observe in the complex (d,c) and Figure also that the values of turbidity increases after the complexity and the reason for that is that the turbidity depends mainly on the values of molecular weight of the compound, and since the molecular weight increased as a result of the complexity and derived from the increase in the complexity chain complexes free material of the increasing values of turbidity. This is reached by the researchers (Al-Bermany, 2003, Samir, 1998).

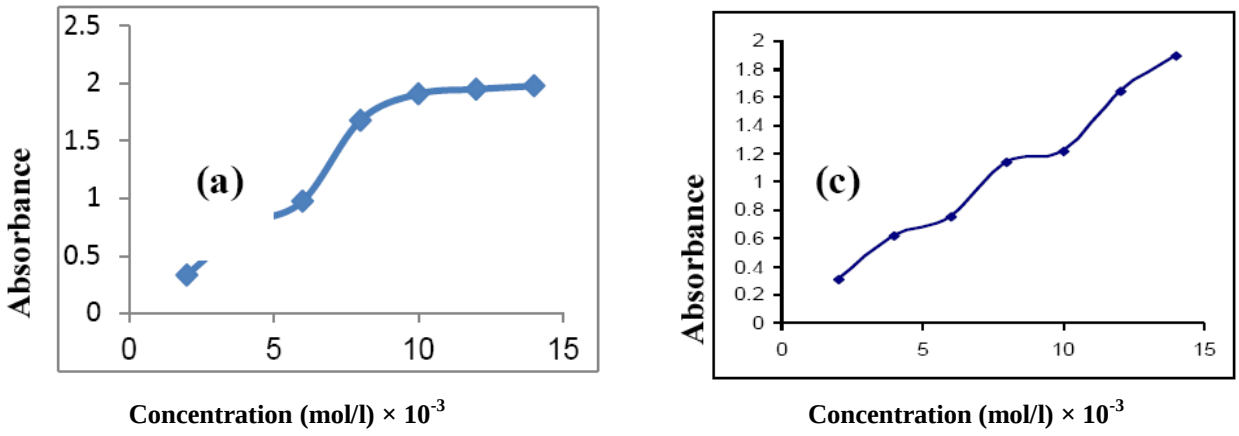
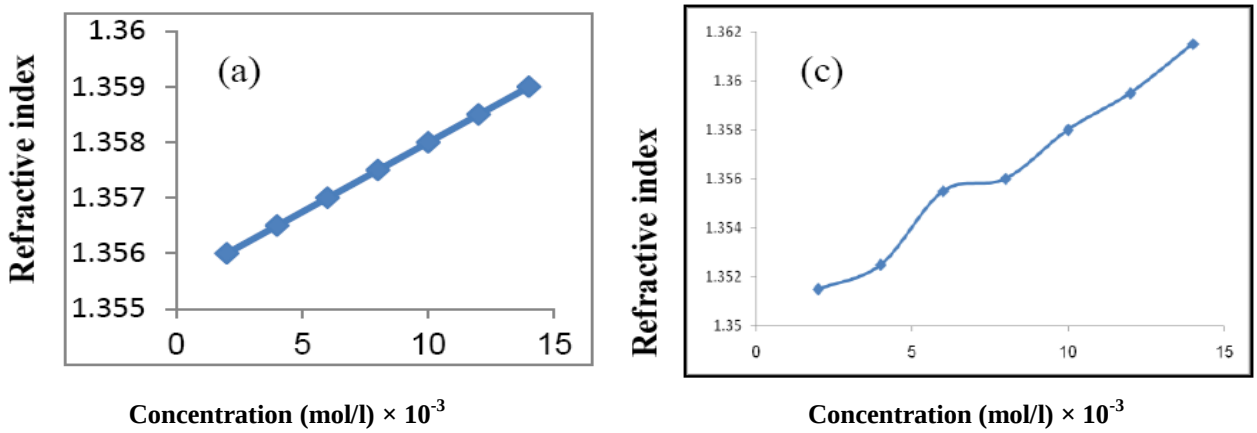


Fig: 2: The variation of absorbance Vs concentration of prepared compounds
(a): ligand(free material) (c): chromium aqueous trivalent (III) chloride (d): iron trivalent (III) chloride.



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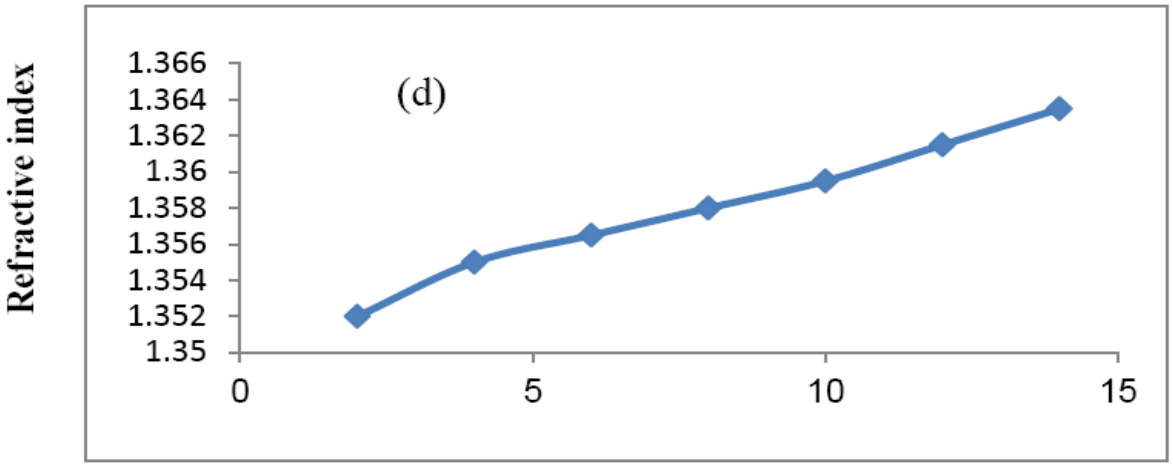
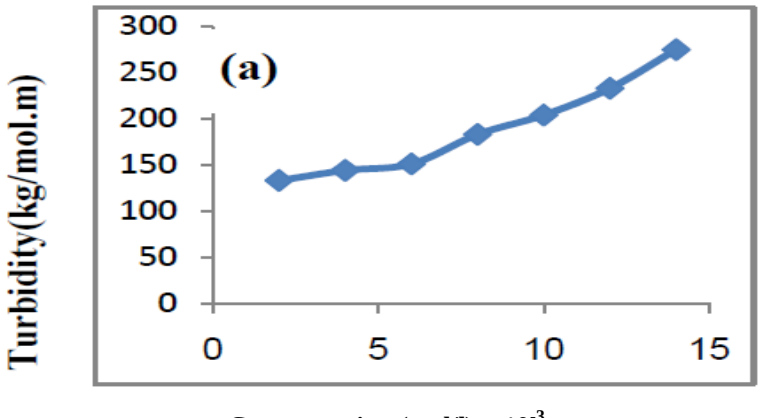


Fig:3: The variation of Refractive index Vs concentration of prepared compounds
(a): ligand(free material) (c): chromium aqueous trivalent (III) chloride. (d): iron trivalent (III) chloride.



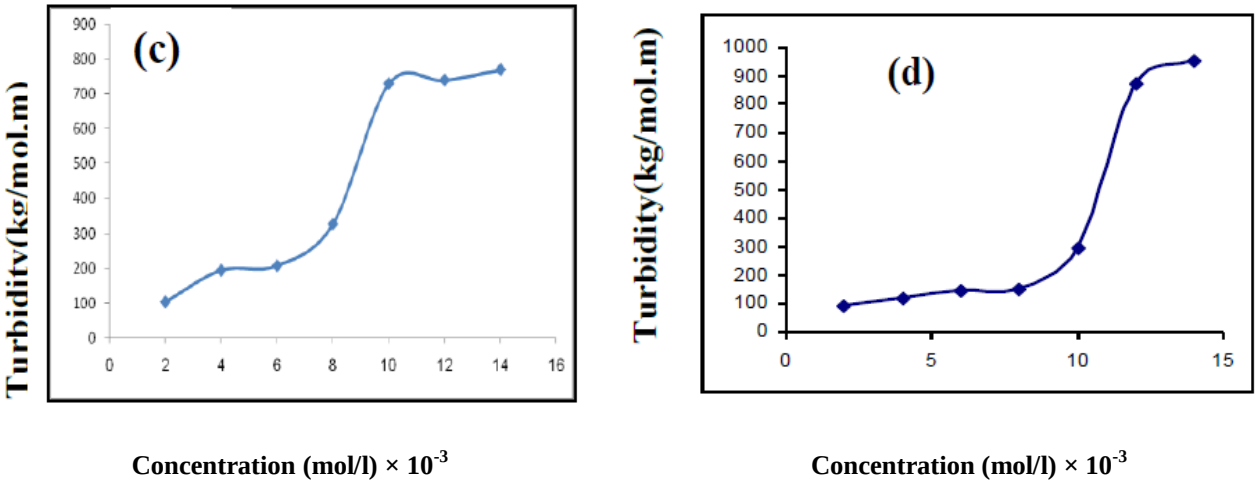


Fig: 4: The variation of turbidity Vs concentration of prepared compounds
(a): ligand(free material) (c): chromium aqueous trivalent (III) Chloride (d): iron trivalent (III) chloride .

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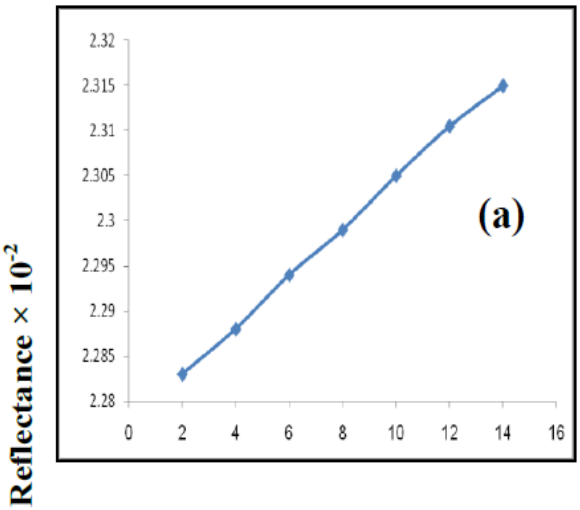
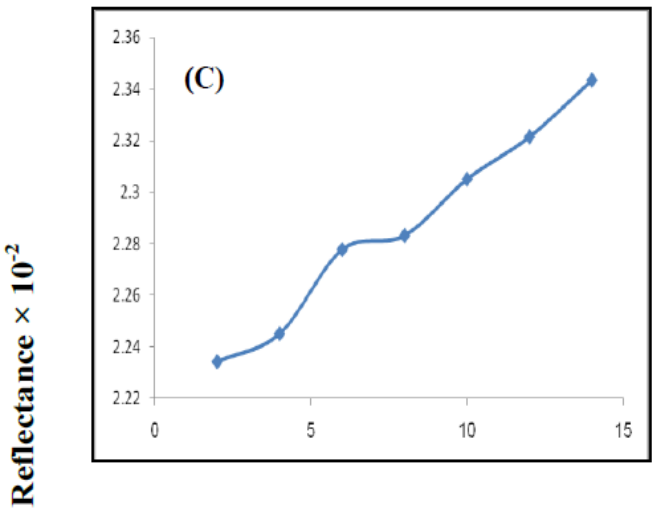
As calculated values of polarization using the relationship (5) ‘and the table below shows the changing values of polarization as increasingly polarized when the complex is due to an increase in molecular weight of complex (c,d) Since the equation (5) depends mainly on molecular weight and the impact factor refraction and concentration to be a slight increase in the value of polarization. These results are consistent with those obtained by the researcher (Abbas Numani ‘2000).Through equation (7) was calculated values of coefficient of finesse as shown in Figure (7), which shows the increase coefficient of thin linear increase with the increase in concentration and the reason that the coefficient of finesse depends mainly on the amount of reflected light, since the behavior of plants similar to the behavior of thin reflective. This is consistent with what obtained by the researchers (Samir Nasraoui ‘1998‘ Al-Bermany‘2003) . Were calculated critical angle of the relationship (8) and Figure (8) shows the changing values of critical angle with the focus. When the fall of the rays from the center of the highest density to the center of less density will occur internal reflection total if the angle is greater than the critical angle, this means that any increase in the intensity of the center lead to increased refractive index, and since the critical angle with an inverse relationship with the refractive index, any increase in the refractive index causes a decrease in the corner critical13. This is the cause of decreasing the values of critical angle with the concentration. This is consistent with the findings of researchers (Al-Bermany ‘20032003‘ in favor.) can be calculated Brewster angle of the relationship (9) and figure (9) shows the increase in the values of the Brewster angle with increasing concentration. It depends Brewster angle values mainly on the refractive index as be of a positive relationship with the refractive index and these findings are consistent with the findings of researchers (Mansor‘1996‘Al-Bermany‘2003).

Table: 1 The Variation of Molar Polarizability of Prepared Compounds

Polarizability $\left(\frac{m^3.kg}{mol}\right)$	
Symbol	P x10-23
Z	1.470
Z2	8.252
Z3	10.985



Concentration (mol/l) × 10^{-3}



Concentration (mol/l) × 10^{-3}

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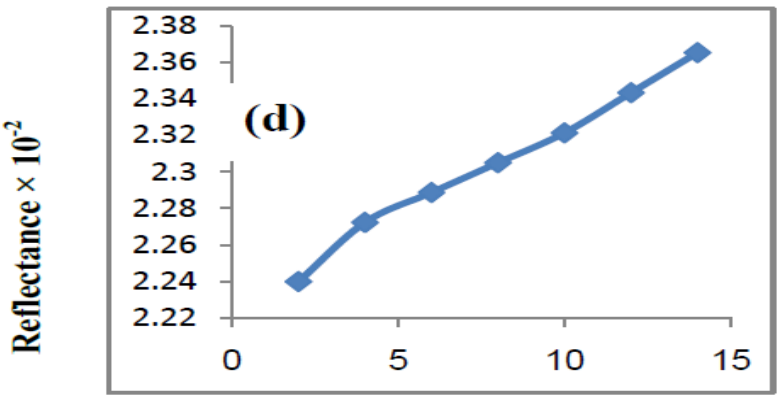
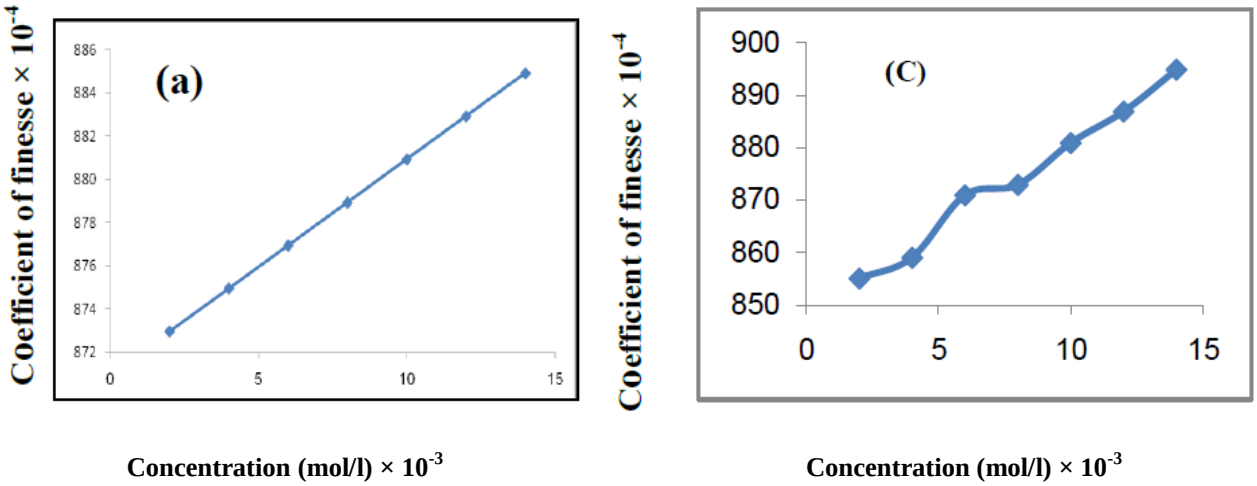


Fig:5 The variation of reflectance Vs concentration of prepared compounds
(a): ligand(free material) (c): chromium aqueous trivalent (III) chloride (d): iron trivalent (III) chloride.



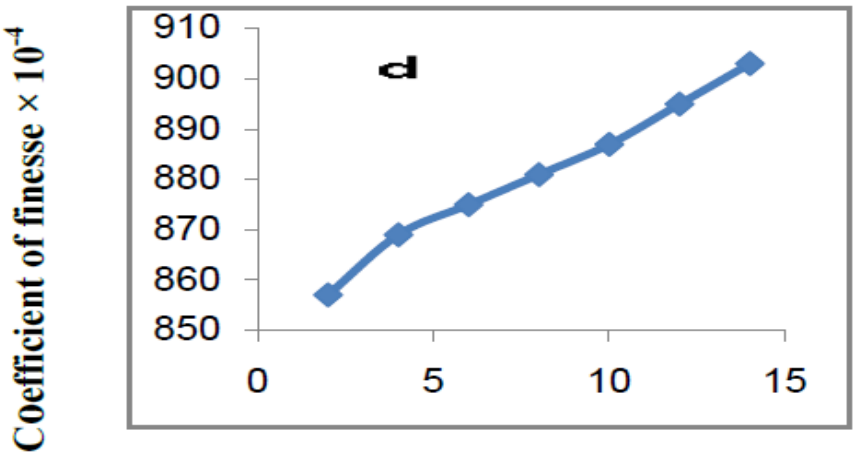


Fig:6: The variation of Coefficient of finesse Vs concentration of prepared compounds

(a): ligand(free material) (c): chromium aqueous trivalent (III) chloride (d): iron trivalent (III) chloride .

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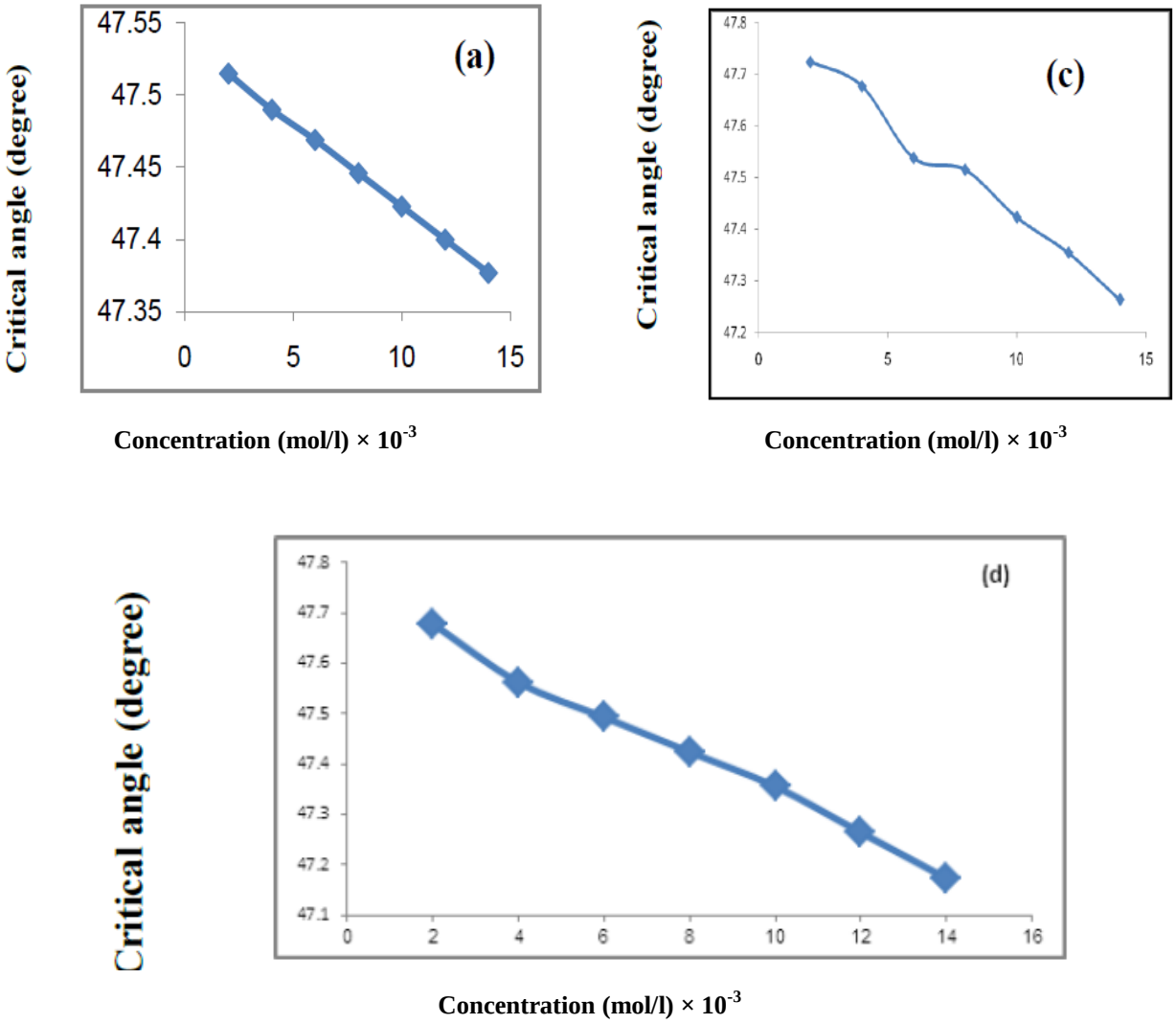
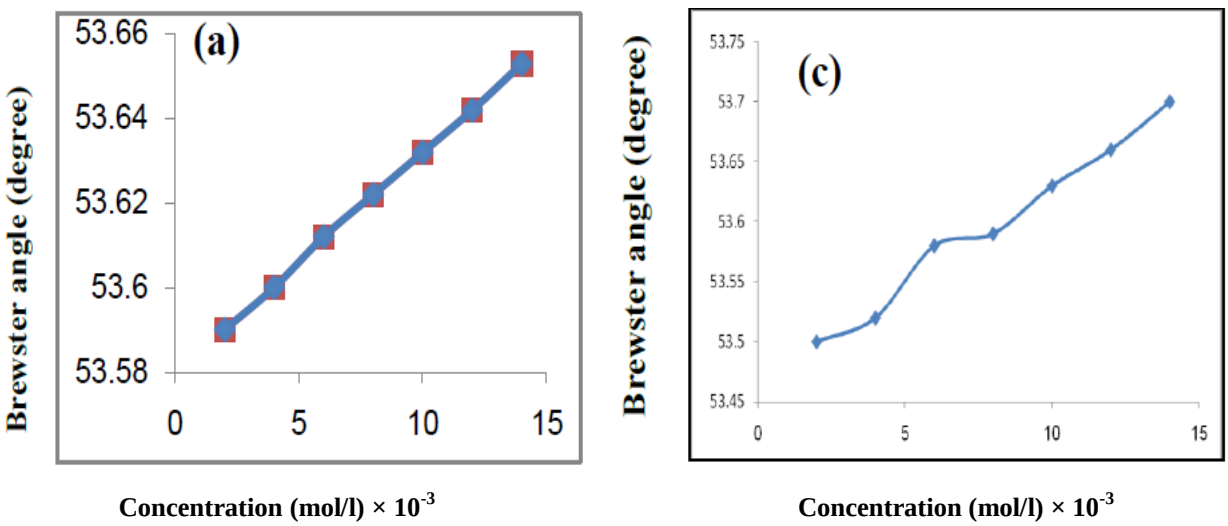


Fig: 7: The variation of critical angle Vs concentration of prepared compounds
(a): ligand(free material) (c): chromium aqueous trivalent (III) chloride (d): iron trivalent (III)chloride



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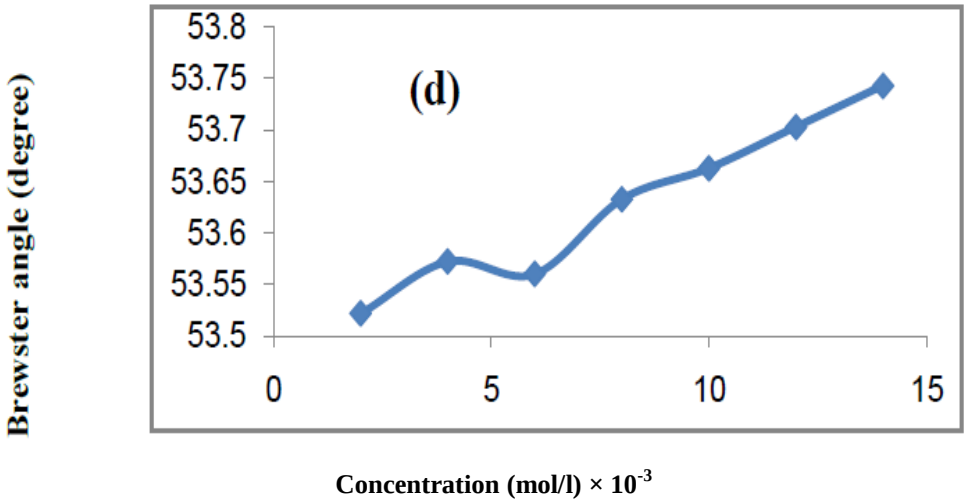

Fig: 8: The variation of Brewster angle Vs concentration of prepared compounds
(a): ligand(free material) (c): chromium aqueous trivalent (III) chloride (d): iron trivalent (III) chloride .

4. CONCLUSIONS

1. That absorbs electromagnetic radiation in the long nm (220-400) in the region within the spectrum (ultraviolet and visible), while implementing these rays in other regions of the spectrum. Absorbent material can be considered good for the ultraviolet wavelengths.
2. Show that the values of the refractive index increases after the complexity of what was at the compound (free material) due to differences in molecular structure and the large molecular weight complex of bivalent nickel (II) and the consequent increase in viscosity proportional.
3. Increase was seen in the reflection of electromagnetic radiation of the solution as a result generated turbidity due to increased density of the solution.

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