Spectral Study of the Pollutants (Gelbstoff) in Water Liquefaction of Some areas of Baghdad Province by Using the Technique of Raman, Flora

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Received in: 23 May 2011, Accepted in: 7 December 2011

Abstract

In this research we study one of the pollutants(Gelbstoff) such as Humic and Fulvic Acids in tap waters by using the technique of Raman, Flora to some regions of Baghdad , the results appear that the tap waters were pollutants which know yellow substance or Gelbstoff instant of suspending waters, which appear through the scattering of the incident light to same the wave length of Raman ,also calculate Raman shift which was 3640 cm^{-1} and force constant to band (O – H) was 743 N/m, where the peak of Raman was at the wave length 441 nm after used the excitation wave length 380 nm . The results were in an agreement with lectures [8][9][10].
Key word: Types of water pollutants, Gelbstoff, Raman spectrum

Introduction

The water is considered one of the oldest source which are known by the human and he deals with this matter which enters the biggest ratio the building of his body and it enters the biggest ratio of his foot ,so this matter has been studied in different sides of physics and chemistry [1] [2] . The pollution Gelbstoff is a term for (yellow coloured) dissolved organic matter in water. Gelbstoff means literally, 'yellow matter' in German. In 1976 Kirk suggested the alternative name 'gilvin' (Latin, gilvus = pale yellow), for the yellow pigments in natural waters, to replace 'yellow substance' or 'gelbstoff '[3]. Gelbstoff or gilvin, is an important component of water quality in natural waters. Quantitative study of gilvin production is however difficult since gilvin is not a well defined substance. Gelbstoff occurs naturally in waters primarily as a result of tannins released from decaying detritus (non-living particulate organic material) [4]. Gelbstoff most strongly absorbs short wavelength light ranging from blue to ultraviolet, whereas pure water absorbs longer wavelength red light. Therefore, non-turbid water with little or no gelbstoff appears blue. The color of water will range through green, yellow-green, and brown as gelbstoff increases. Well in fact I suppose is well known that if you mix blue and yellow you get green and form the pollution which is known as yellow matter or it is called Geltbstoff [5] . we call this pollution matter by yellow matter belongs to its high absorption in the area of (U.V) ray and the blue of the spectrum [6] .

Theoretical

Gelbstaff or yellow substance has double bonds, which participate in the changes that take place in the resultant spectrum , therefore when light falls on the dissolving substances, the absorbing pant follows Beer Lambert law that states the amount of the absorbing light appropriate with the number of the absorbing particle. This law can be expressed as:-

$\text{Log}\ (I / I_o) = C\varepsilon L$ ………………… (1)

Where:

I_o , I : incident and transmitted intensity respective

C : is the matter concentration (mol),L :is the cell thickness (cm)

ε : molar absorptive

The molecule of water which did not absorb in range of dissolving material absorption , is the polarized by the electric field action of the incident rays that leads to emission of Raman spectrum that follow the Law next law : -

$\upsilon_R = \upsilon_{ex} \pm \Delta\upsilon$ …………….. (2)

where :

υ_R : is wave number of scattered ray (Raman) ,υ_{ex} : is wave number of excitation ray, $\Delta\upsilon$: is the different in the vibration levels .
The positive and negative sign represent the shift toward long and short wavelength respectively.

Experimental

Many samples from tap water were taken from different regiens of Baghdad such as Al- Atefia, Al – Mansor, Al – Hurria, Sabea abkar, Nafg Al – Shurta, Al – Aneearia, Al – Beaa, Al – Shurta Al – Kamisa, Matar Al – Muthana, Al – Jadiria, Al – Amiria, Al – Kamalia, Madient Al – Sadar, Zeona, Bob Al – SHAM, standard water of Suidia ,standard water of Suidia for the compare .

Measurements were made in (spectro fluoro photometer shimatzn) of water the contaminated materials and Raman spectrum in 2April 2010, Lab of Physics/College of science /University of AL-Mustansiriyah, Which consists of the device of two basic units, the unit, which consists of all the parts needed in the measurement process as it includes a lamp Zenon-capacity 150 watts if given the long wavelengths (200-800) nm and contains a unit recording, which is a complex electronic system consists of an electronic calculator which is the implementation of all directives to the main unit, also the samples were taken from different areas of the above measurements were taken for the fluorescence spectrum and Raman spectrum of samples in the quartz cell 1cm×1cm×5cm.

Results and Discussion

It was noticed from the figure (3) to (18) that there are three types of spectrum to show that the light incidence with wavelength 380 nm that is in the same of the excited wavelength, this spectrum belongs to the scattering to rayle spectrum and it confirms the bigger ratio of this scattering spectrum, this spectrum at the partial reelecting to the same level and then backing transferred. From the spectrum noticed that the wavelength 441 nm belongs to Raman scattering so called the non elastic scattering and that spectrum appears after the lost of molecule part of its energy and it confirms then suffer from red shift towards the long wavelength.

The third spectrum consider it as a wide bundle belongs to the Florence spectrum for the Gelbstoff or yellow substance and the absorption led to the transfer between the electronic levels when these levels suffer in the high excited levels to the ground level that led to emission of fluorescence spectrum and with wide bundle for the polluted substance, also we notice that the difference in the rational intensity from the shapes of Florence spectrum for the polluted substance and the reason for that according to the differences in the ratio these substances Gelbstoff in the selected samples and that it goes according to Berz lambart in equation (1), where the increasing in pollution lead to increase in relative intensity for florescence spectrum as illustrated in figures(7) (8) (12) .

The pollution ratio in the sample of regions (Itafia , Mansour ,and Mashtal) are larger than appeared in the other samples and also pollution ratio is negligible in Medinat Al–sader sample and consequence with the standard sample of water that is produced in Saudi company For Raman spectrum it observed the difference in relative Intensity that due to variation in pollutions that scatter the spectrum or the incident light with the same wave length of Raman spectrum [6] [7] where the increasing of this pollution in the water means increasing ratio of scattered spectrum and vice versa [8] with respect to Raman spectrum it was calculated from the relation [9] .

$$\Delta \upsilon = 10^7 [(1 / \lambda_{ex}) - (1 / \lambda_R)] \text{ ----------------------- } (3)$$

λ_{ex} : Excitation wave length

λ_R : Raman wave length

where the Raman shift at 3630 nm and that consequence to most researcher that reach [6] [8] [10] and also calculate force constant of bound from relations :-

$$\Delta \upsilon = 1/2\, c \sqrt{K / M} \text{ ----------------------------------- } (4)$$

Where:
M: reduces mass and equals $m_H M_o / m_H + M_o$, C : light speed
K: extinction coffeicens , m_H: mass of hydrogen ,m_o: mass of oxygen .
Where the force constant(741 N/m) and that consequence to the most researchers that reaches [6]

Conclusions

had been studied many samples of water for different regions show that Al–Sadar City is the best sample selected in the proportion of pollution compared with ather samples which contained a high proportion of the pollutants exceed allowable which depend on the stander water sample of water to(Saudi company), also in Raman spectrum note that the samples selected contain a proportion of contaminated materials, which cause an increase in the proportion of the relative intensity of the Raman spectrum.

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Table (1) :Relative intensity of Gelbstoff and Peak of Gelbstoff

No	Samples	Relative intensity of Gelbstoff(a.u)	Peak of Gelbstoff (nm)
1	Al – Kamalia	0.045	Out of scale
2	Al- Atefia	0.028	460
3	Al – Mansor	0.024	460
4	Al – Aneearia	0.015	459
5	Sabea abkar	0.015	459
6	Al – Jadiria	0.0125	459
7	Al – Hurria	0.01	458.5
8	Bob Al – SHAM	0.007	457
9	Al – Shurta Al - Kamisa	0.0065	457
10	Nafg Al – Shurta	0.004	456
11	Al – Beaa	0.0035	456
12	Zeona	0.003	456
13	Matar Al – Muthana	0.0025	456
14	Al – Amiria	0.0025	456
15	Madient Al – Sadar	0.000	……

16	standard water of Suidia	0.000	……

Table (2): Relative intensity of Raman and Peak of Raman

NO	Sample	Relative intensity of Raman (a.u)	Peak of Raman (nm)
1	Al- Atefia	Out of scale	…….
2	Al – Mansor	Out of scale	…….
3	Al – Hurria	Out of scale	…….
4	Sabea abkar	Out of scale	…….
5	Nafg Al – Shurta	0.052	441
6	Al – Aneearia	0.05	441
7	Al – Beaa	0.05	441
8	Al – Shurta Al - Kamisa	0.05	441
9	Matar Al – Muthana	0.048	441
10	Al – Jadiria	0.046	441
11	Al – Amiria	0.045	441
12	Al – Kamalia	0.045	441
13	Madient Al – Sadar	0.044	441
14	Zeona	0.03	441
15	Bob Al – SHAM	0.029	441
16	standard water of Suidia	0.023	441

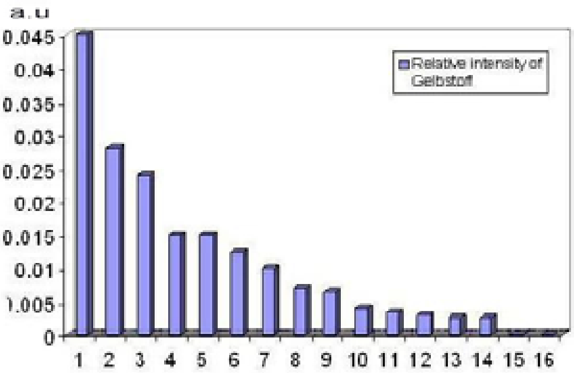


Fig .(1) :Relative intensity (a.u) of samples for Gelbstoff

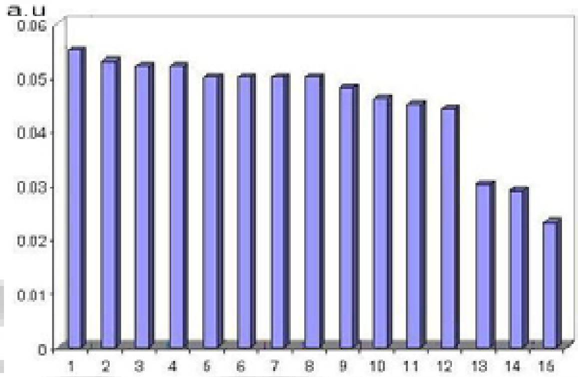


Fig. (2) Relative intensity (a.u) of samples for Raman Scattering

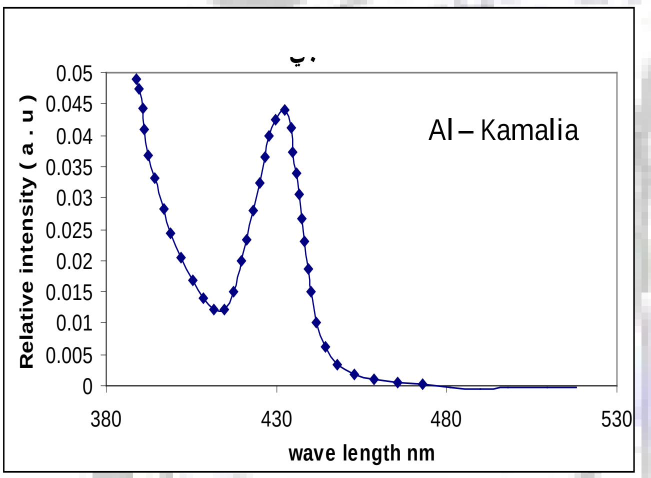


Fig. (3)

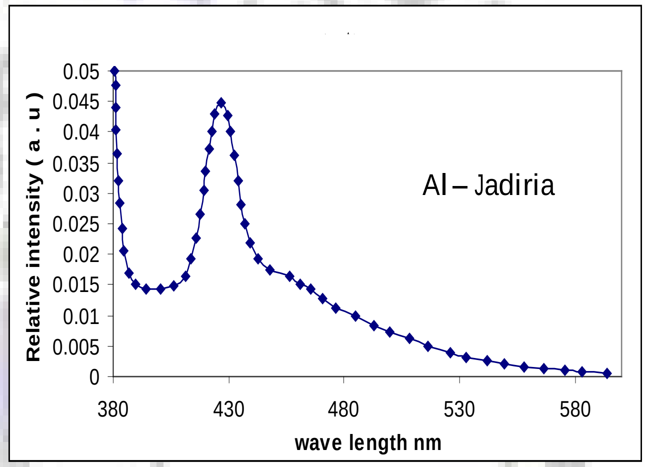
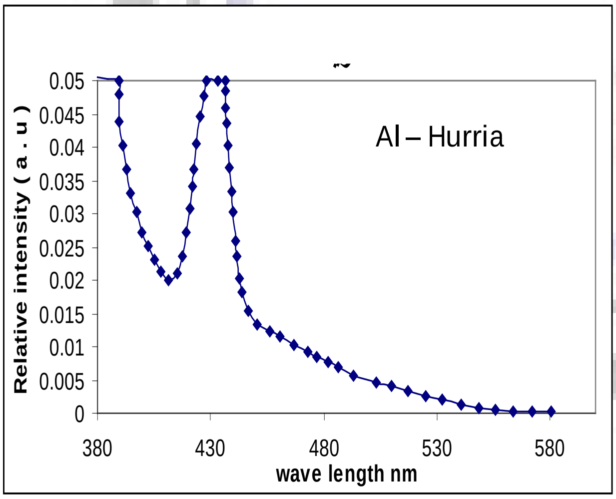


Fig. (4)



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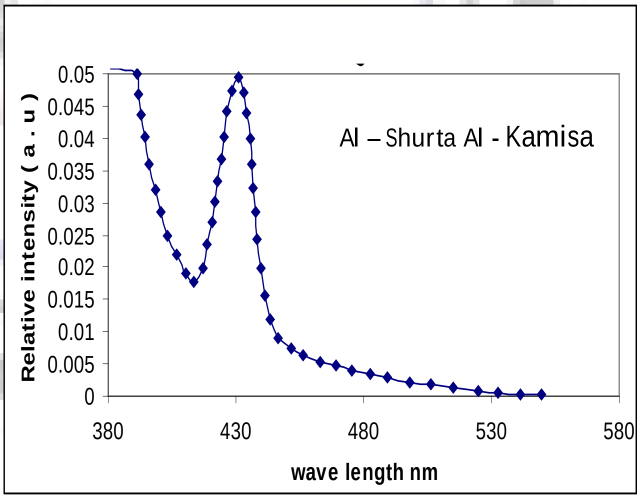

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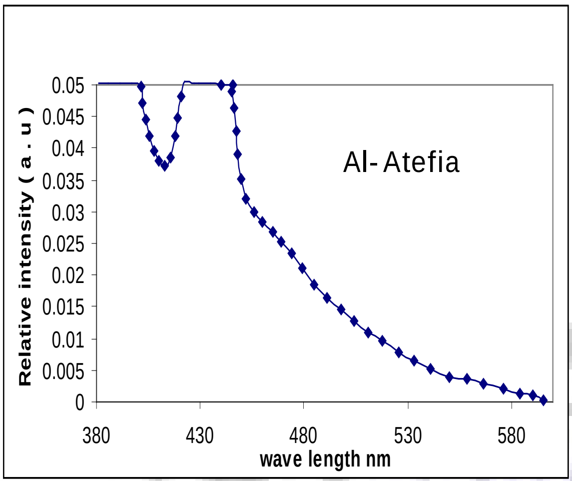

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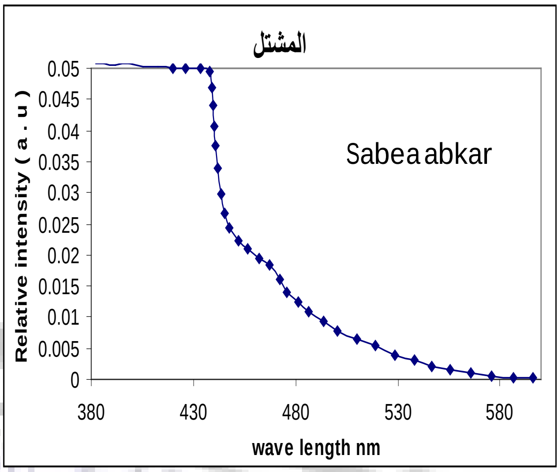

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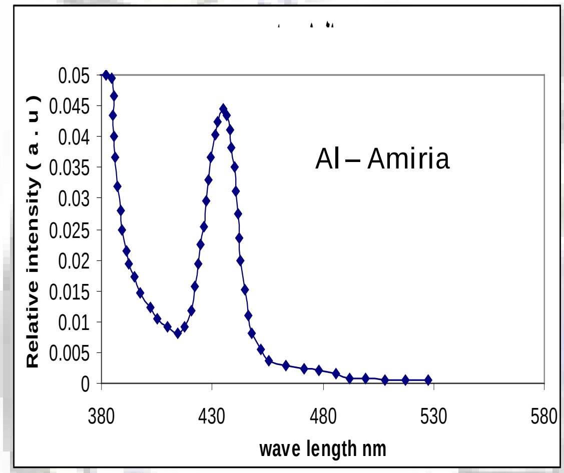
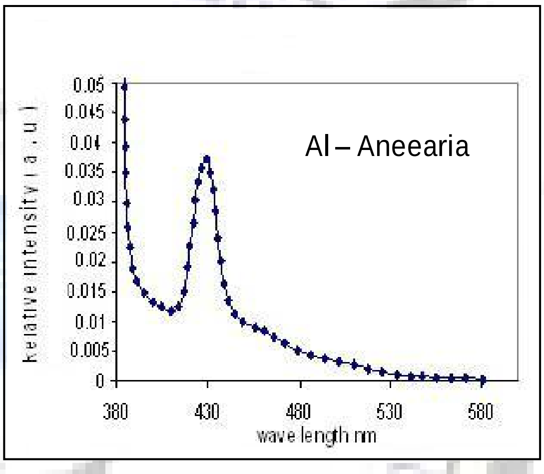


Fig .(9)



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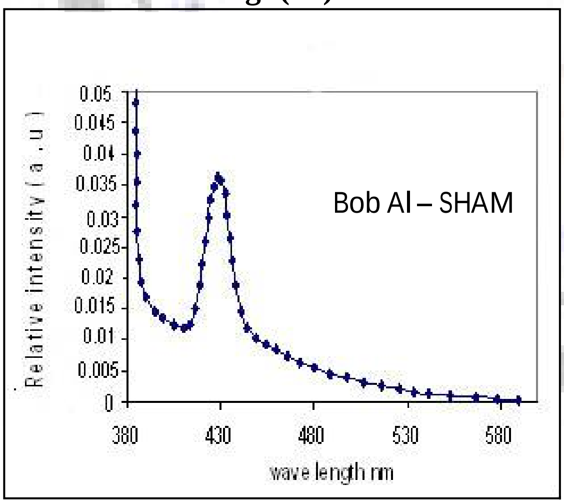

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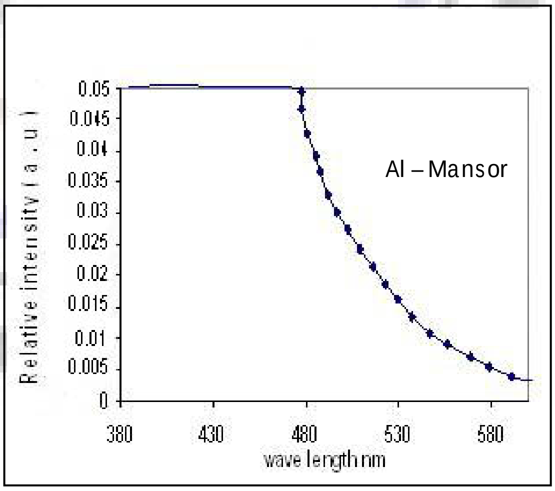

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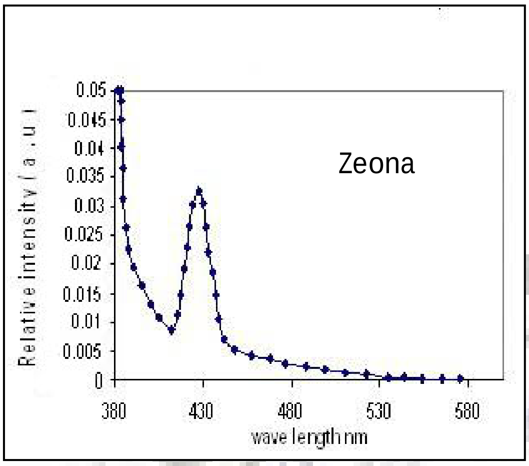

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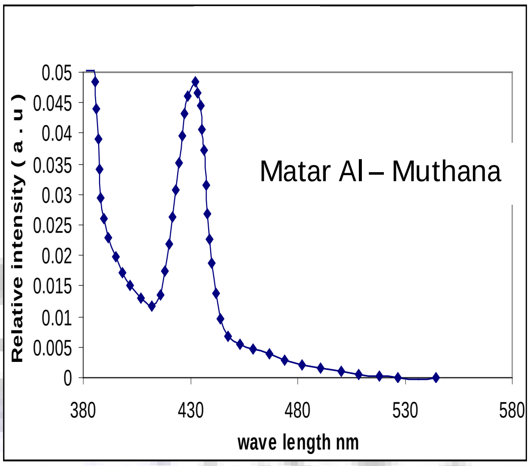

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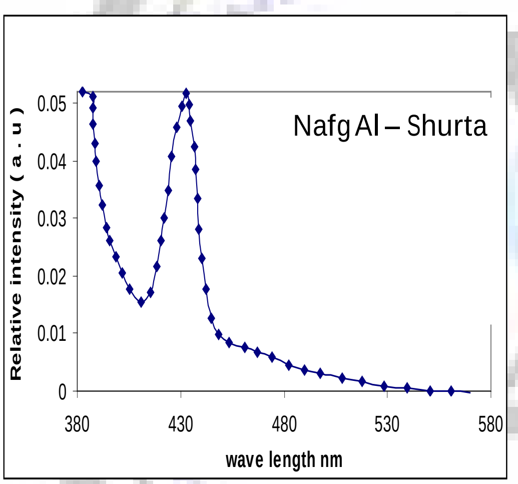

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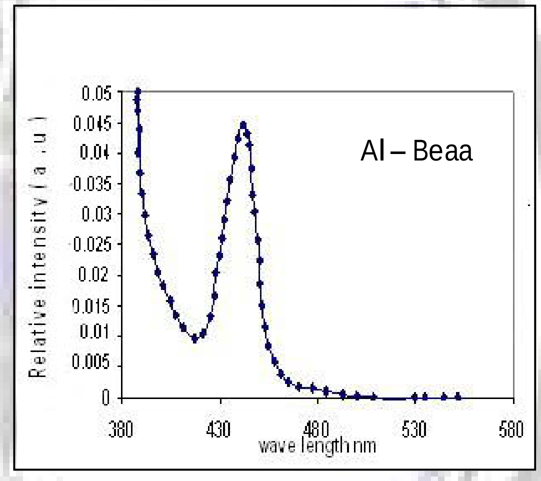

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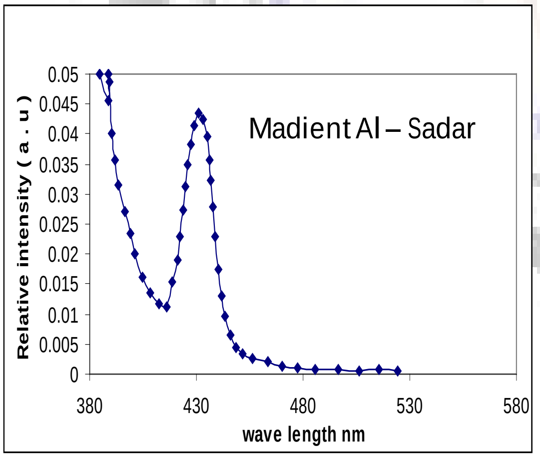

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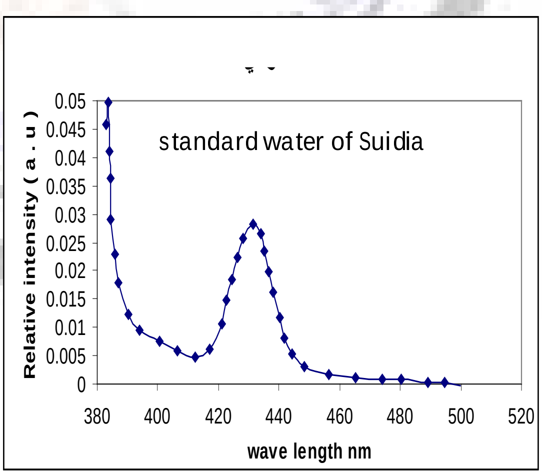

Fig. (18)

دراسة طيفية للملوثات (المادة الصفراء) في إسالة المياه من بعض مناطق محافظة بغداد باستخدام تقنية رامان، فلورا

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استلم البحث في :23 ايار 2011 قبل البحث في:7 كانون الاول 2011

الخلاصه

تم في هذا البحث دراسهÃحد الملوثات الكيميائية التي تعرف بالمادة الصفراء والتي هي خليط من حامض æFulvic Humic الموجوده في مياه الاساله باستخدام تقنية رامان، فلورا لبعض مناطق محافظه بغداد ، واظهرت النتائج احتواء مياه الاساله على نسب من الملوثات التي تعرف بالماده الصفراء Gelbstoff فضلا" عن الى احتوائها على نسب من المواد العالقه التي تظهر من خلال تشتيت الضوء الساقط بالطول الموجي بنفسه لرامان ، و تم حسبت أزاحه طيف رامان و التي كانت$^{-1}$ 3640 cm¡ وحساب ثابت القوĔ للاصرĔ (O – H) وكان قيمته 743 N/m ÐÇ¡ ان قيمة طيف رامان كانت عند الطول الموجي 441nm بعد استخدام طول موجي مهيج 380 nm و جميع هذه النتائج كانت مقاربة مع الدراسات السابقة[10][9][8].

الكلمات المفتاحية: تلوث الماء ، المادة الصفراء ،أطياف رمان