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علمية دولية مُحكمة ربع سنوية - تصدر بالشراكة مع كلية المنهل للعلوم - السودان

في هذا العدد:

- **أثر سياسة الإنفاق العام على معدلات التضخم في السودان خلال الفترة (1992-2021م)**
  أ. إدريس طه إدريس الحاج محمد
  أ.د. حسن بشير محمد نور

- **الحج وأثره على الأوضاع الداخلية في الحجاز**
  د. محمد عبد الكريم محمد الكنيدري

- **أسس تجديد النحو التعليمي عند شوقي ضيف والمجامع اللغوية العربية**
  أ. مشلب محمد الشين
  د. صلاح رمضان عبد الله عبد البين

- **الموقف العثماني من الأطماع الأوروبية في الحجاز (1900 - 1920م)**
  أ. عبد العزيز بن حماد الحماد

- **An overview of the assessment of earthquake events in Sudan**
  Dafalla Wadi
  Randa Ali
  Mohammed Abdallsamed
  Ibrahim Malik
  Abdelmottaleb Aldoud

- **Studying some Physical Properties of Water by using Magnetic Resonance**
  Dr. Mohammedain Adam Allhgabo Belal
  Dr.Ali Salih Ali Salih
  A.Marwa Abdelrhem Eldow Noraldeen

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موجهات النشر

تعريف المجلة:

مجلة (القُلزم) للدراسات العلمية مجلة علمية محُكمة تصدر عن مركز بحوث ودراسات دول حوض البحر الأحمر - السودان، بالشراكة مع أكاديمية المنهل للعلوم - السودان. تهتم المجلة بالبحوث والدراسات العلمية والمواضيع ذات الصلة بدول حوض البحر الأحمر.

موجهات المجلة:

1. يجب أن يتسم البحث بالجودة والأصالة، وألا يكون قد سبق نشره قبل ذلك.
2. على الباحث أن يقدم بحثه من نسختين. وأن يكون بخط (Traditional Arabic) بحجم 14 على أن تكون الجداول مرقمة وفي نهاية البحث وقبل المراجع على أن يشار إلى رقم الجدول بين قوسين دائريين .
3. يجب ترقيم جميع الصفحات تسلسلياً وبالأرقام العربية بما في ذلك الجداول والأشكال التي تلحق بالبحث.
4. المصادر والمراجع الحديثة يستخدم أسم المؤلف، اسم الكتاب، رقم الطبعة، مكان الطبع، تاريخ الطبع، رقم الصفحة.
5. المصادر الأجنبية يستخدم اسم العائلة (Hill, R).
6. يجب ألا يزيد البحث عن 30 صفحة، وبالإمكان كتابته باللغة العربية أو الإنجليزية.
7. يجب أن يكون هناك مستخلص لكل بحث باللغتين العربية والإنجليزية على ألا يزيد على 200 كلمة بالنسبة للغة الإنجليزية. أما بالنسبة للغة العربية فيجب أن يكون المستخلص وافياً للبحث بما في ذلك طريقة البحث والنتائج والاستنتاجات، مما يساعد القارئ العربي على استيعاب موضوع البحث وبما لا يزيد عن 300 كلمة.
8. لا تلزم هيئة تحرير المجلة بإعادة الأوراق التي لم يتم قبولها للنشر.
9. على الباحث إرفاق عنوانه كاملاً مع الورقة المقدمة (الاسم رباعي، مكان العمل، الهاتف، البريد الإلكتروني).

نأمل قراءة شروط النشر قبل الشروع في إعداد الورقة العلمية.

بسم الله الرحمن الرحيم

كلمة التحرير

الحمد لله رب العالمين، والصلاة والسلام على سيدنا محمد وعلى آله وصحبه أجمعين

وبعد:

القارئ الكريم،،،

السلام عليك ورحمة الله وبركاته.. نطل على حضراتكم من نافذة جديدة من نوافذ النشر العلمي وهي مجلة القلزم العلمية، ونحن في غاية السعادة والمجلة تصل عددها التاسع والثلاثون بفضل الله تعالى ومنته.

القارئ الكريم:

هذه المجلة تصدر بالشراكة مع أكاديمية المنهل للعلوم وهي إحدى الأكاديميات السودانية الفنية التي وضعت بصمات مميزة في مسيرة البحث العلمي، وهذا العدد هو التاسع والثلاثون في إطار هذه الشراكة العلمية التي تأتي في إطار استراتيجية مركز بحوث ودراسات دول حوض البحر الأحمر في تفعيل الحراك العلمي والبحث داخل السودان وخارجه.

القارئ الكريم:

هذا العدد يشتمل على عدد من البحوث والدراسات المهمة ذات البعد النظري والتطبيقي ولضمان نجاح واستمرارية هذه المجلة بإذن الله تعالى نأمل أن يرفدنا الباحثون بمزيد من اسهاماتهم العلمية المميزة مع خالص الشكر والتقدير للجميع..

أسرة التحرير

المحتويات

الموضوع	الصفحة
أثر سياسة الإنفاق العام على معدلات التضخم في السودان خلال الفترة (1992-2021م) أ. إدريس طه إدريس الحاج محمد أ.د. حسن بشير محمد نور	9
الحج وأثره على الأوضاع الداخلية في الحجاز د. محمد عبد الكريم محمد الكنيدري	35
أزمة المثال عند الأصوليين د. علي محمد علي الصادق	77
الإدارة بالاستثناء وأثرها علي الأداء المؤسسي **(دراسة على عينة من شركات التعدين إقليم النيل الأزرق ـ السودان خلال العام 2024م)** أ. هادية خالد القاضي حمراوي د. التجاني الغزالي عبد الخير محمد	95
أسس تجديد النحو التعليمي عند شوقي ضيف والمجامع اللغوية العربية أ. مشلب محمد الشين د. صلاح رمضان عبد الله عبد البين	117
الموقف العثماني من الأطماع الأوروبية في الحجاز (1900 - 1920م) أ. عبد العزيز بن حماد الحماد	139

القياس بين البصريين والكوفيين **(دراسة تطبيقية في بعض القراءات القرآنية)** أ. حليمة محمد علي عثمان د. صلاح رمضان عبد الله عبد البين	181
التدافع اللغوي في عصر العولمة **(اللغة العربية نموذجاً)** أ. إكرام عبد الرازق إبراهيم العيسابي د. هناء محمد أبوزينب محمد	223
An overview of the assessment of earthquake events in Sudan Dafalla Wadi Randa Ali Mohammed Abdallsamed Ibrahim Malik Abdelmottaleb Aldoud	237
Studying some Physical Properties of Water by using Magnetic Resonance Dr. Mohammedain Adam Allhgabo Belal Dr.Ali Salih Ali Salih A.Marwa Abdelrhem Eldow Noraldeen	275

Studying some Physical Properties of Water by using Magnetic Resonance

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Abstract:

This study examined some physical properties (frequency, wavelength and magnetic intensity) of water and their relationship to absorption and chemical displacement via magnetic resonance. The study aimed to identify the physical properties of water by using magnetic resonance technology. A sample of water was prepared, then magnetic resonance spectroscopy was used to review the spectrum of this sample. The relationship of frequency and wavelength with the absorption spectrum and the relationship of magnetic intensity with chemical displacement were determined, and graphical relationships were drawn between absorption and both wavelength and frequency, and a graphical relationship was also drawn between magnetic intensity and chemical displacement. The data for this study were analyzed using the (Origin 8.6) program, version 6. The results showed that there are experimental relationships for both wavelength and frequency with absorption, and there is also an experimental relationship between magnetic intensity and chemical displacement, and this is consistent with the theoretical relationship .The absorption spectrum of water gives information about the

electronic transitions allowed when visible light is shined on it. It has also been observed that the magnetic field causes a change in chemical energy. These results recommend studying the absorption and chemical displacement spectra resulting from applying the magnetic field to more compounds that are consistent with theoretical relationships to explain the chemical displacement phenomenon.

Keywords: magnetic resonance, water, chemical displacement, frequency, wavelength and magnetic intensity.

دراسة بعض الخصائص الفيزيائية للماء باستخدام الرنين المغنطيسي

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المستخلص:

تناولت هذه الدراسة بعض الخصائص الفيزيائية (التردد، الطول الموجي والشدة المغنطيسية) للماء وعلاقتها بالامتصاص والإزاحة الكيميائية عن طريق الرنين المغنطيسي. هدفت الدراسة إلى التعرف على الخواص الفيزيائية للماء وذلك باستخدام تقنية الرنين المغنطيسي، حُضرت عينة من الماء، ثم أُستخدم مطياف الرنين المغنطيسي لاستعراض طيف هذه العينة. حُددت علاقة التردد والطول الموجي مع طيف الامتصاص وعلاقة الشدة المغنطيسية مع الإزاحة الكيميائية، ورُسمت علاقات بيانية بين الامتصاص وكل من الطول الموجي والتردد وأيضاً رُسمت علاقة بيانية بين الشدة المغنطيسية والإزاحة الكيميائية. وحُللت بيانات هذه الدراسة باستخدام برنامج (Origin 8.6) النسخة 6. وأوضحت النتائج أن هناك علاقات تجريبية لكل من الطول الموجي والتردد مع الامتصاص وأيضاً هناك علاقة تجريبية بين الشدة المغنطيسية والإزاحة الكيميائية وهذا يتسق مع العلاقة النظرية وأن طيف الامتصاص للماء يعطي معلومات عن الانتقالات الإلكترونية المسموح بها عند تسليط ضوء مرئي عليها. كما لوحظ أن المجال المغنطيسي يحدث تغيراً في الطاقة الكيميائية. تُوصى هذه النتائج بدراسة طيف الامتصاص والإزاحة

الكيميائيـة الناتجـة عـن تسـليط المجـال المغنطيـسي عـلى المزيـد مـن المركبـات التـي تتسـق مـع العلاقـات النظريـة لتفسـير ظاهـرة الإزاحـة الكيميائية.

الكلـمات المفتاحيـة: الرنـين المغناطيـسي، المـاء، الإزاحـة الكيميائيـة، الـتردد، الطـول الموجـي والشـدة المغنطيسـية.

Introduction:

Scientists discovered magnets a long time ago, and their well-known properties, such as attracting iron and generating electricity, were identified through numerous experiments conducted by scientists. When theories of the atom came into existence, scientists were able to explain the emergence of the magnetic field. Scientists attributed the generation of the magnetic field of the atom to the movement of the charged electron in its orbit around the nucleus [1]. The development of atomic theory led to the development of magnetic field theories significantly. The result of this was the classification of magnetic materials into three types: The first type generates the magnetic field and is called the ferromagnetic material. The second type strengthens the magnetic field and is called the paramagnetic material. The third type opposes the magnetic field and weakens it and is called the antimagnetic material [2]. This led to the expansion of the technical applications of magnetism to include, in addition to generating electricity, the manufacture of high-speed trains and the manufacture of high-capacity medical diagnostic devices. The magnetic field was also used in treatment [3]. The magnetic properties of the material have many advantages that make it included in various vital applications. Magnetic resonance depends on these magnetic properties and is widely used in diagnosis and is considered one of the most accurate diagnostic methods for soft tissues. The magnetic field inside the atom is generated by the rotation of negative electrons and positive protons around themselves and around the center of the nucleus or any other axis. The rotation of these charges generates an electric current, which generates a magnetic field [4]. The magnetic moment is formed in a particular atom as a result of the magnetic moments

of the electrons and protons that rotate around themselves, generating vortex magnetic spin moments, and when they rotate around a specific axis, they generate an orbital magnetic moment [5]. Magnetic materials are divided into three main categories:

1. Paramagnetism.
2. Diamagnetism.
3. Ferromagnetism.

Paramagnetic materials: These are materials that possess magnetic moments and whose atoms act as small magnets. They are arranged in the direction of the external magnetic field, strengthening it. The paramagnetic phenomenon arises as a result of the presence of individual, unpaired electrons in the shells of atoms or ions, and they have magnetic moments that are distributed randomly. When a magnetic field is applied, these moments are organized in the direction of the magnet. The magnetic susceptibility is positive, but it is very small. The permeability is calculated and is Closest to the correct one [6]. As for diamagnetic materials, they are materials whose atoms do not have magnetic moments, so they do not act as small magnets, but rather act as a self-induction coil. When an external magnetic field is applied to the atom, it generates a self-inducing magnetic field that opposes the external field and weakens it, so the magnetic susceptibility is negative, and it depends on the temperature [7]. Langevin's theory explains that the current resulting from the movement of the electron in a circular path leads to the emergence of a continuous magnetic moment. Movement [8]. As for ferromagnetic materials, "ferromagnetic materials" are materials whose atoms act as small magnets, but they differ from paramagnetic materials in that they remain aligned in the direction of the external field even after its disappearance. Therefore, they act as permanent magnets [9]. The Zeeman effect deals with the effect of the magnetic field on An atom with electrons whose magnetic moments are opposite, these electrons act as small magnets that attract and repel each other

with the external field, acquiring a different potential energy. This difference leads to a difference in the energies of the electrons, and gives the change in energy ΔE from the relationship:

$$\Delta E = E_+ - E_- = \hbar\omega = g m_s \beta H$$

$m_s \equiv$ The spin quantum number of a magnet

$\beta \equiv$ Bohr magnetism

$H \equiv$ Magnetic field

$g \equiv$ Landi diffusion coefficient[10].

Theoretical Background:

Water:

Water is a transparent, colorless, odorless substance. It is the basic component of streams, lakes, seas, and oceans, as well as the fluids in all living organisms. It is the most widespread chemical compound on the surface of the Earth. The water molecule consists of a central oxygen atom to which two hydrogen atoms are connected on either end by a covalent bond, so that its chemical formula is H_2O. At standard conditions of pressure and temperature, water is a liquid; The solid state is formed at the freezing point, and is called ice. The gaseous state is formed at the boiling point, and is called water vapor. Water is the basis for the existence of life on planet Earth, and it covers 71% of its surface, and sea and ocean water represents the largest percentage of water on Earth, amounting to about 96.5%. The remaining percentages are distributed between groundwater and the ice of the polar regions (1.7% for both), with a small percentage in the form of water vapor suspended in the air in the form of clouds, and sometimes in the form of fog or dew, in addition to rain or snow showers[11,12]. The percentage of fresh water is only about 2.5% of the water present on Earth, and most of this amount (about 99%) is

present in the ice masses in the polar regions, while 0.3% of fresh water is present in rivers, lakes, and in the atmosphere [11]. As for nature, the state of water changes between the three states of matter on the surface of the Earth constantly through what is known as the hydrological cycle (or water cycle), which includes the occurrence of evaporation and transpiration (evaporative transpiration), then condensation, precipitation, and then flow to reach the mouth in bodies of water. Obtaining a pure source of drinking water has been important to the emergence of civilizations throughout history. In recent decades, cases of fresh water scarcity have been recorded in many regions of the world. United Nations statistics have estimated that about a billion people on the surface of the Earth still lack the means available to access a safe source of drinking water, and that about 2.5 billion lack an appropriate means for Water disinfection [13].

Physical properties of water:

Frequency:

It is a measure of the frequency of a periodic event, such as the frequency of a wave. Often we are talking about the frequency of a sound wave, the frequency of a light wave, or an electromagnetic wave. Since 1960, the frequency unit has been measured in the hertz (Hz), which is equivalent to 1/second. It is mainly used to measure the repetition number of a wave oscillation. The frequency of a periodic wave is 1 Hz if it goes through a complete cycle at a point in one second. The complete cycle of a wave. Let us imagine here a wave in the water. The wave in the water continues from rising to falling and then rising. This is the complete cycle. The distance between two successive crests in a wave or the distance between two successive troughs in a wave is called the wavelength [14,15,16].

Wave length:

Wavelength is the distance separating similar identical wave units, that is, it is the distance separating similar phases (peak with crest or trough with trough). There are a number of waves that we observe daily, such as light, sound or water waves. There is an inverse relationship between wave length and frequency. If two waves have the same speed, the shorter wave will have a greater frequency. In practice, a wave is a disturbance in local properties, such as pressure in sound and water waves or the intensity of the electromagnetic field in light waves[17].The extent to which human senses (such as sight or hearing) react to waves varies according to the wavelength. From the electromagnetic spectrum, the human eye can only pick up waves whose length ranges from 400 to 700 nanometers, while the ear picks up waves with a frequency between 20 Hz and 20 kHz, meaning that the longest waves range between 17 meters and 17 millimeters, respectively (1 kHz = 1000 Hz)[18].

Magnetic intensity:

Magnetic field strength is the strength of the magnetic field distributed at every point in space in a specific, uniform direction. It is symbolized by the symbol H. It is related to the property of matter with the equation:

$$\vec{B} = \mu . \vec{H}$$

Where represents the magnetic flux density, represents the permeability of the material to the magnetic field, and represents the magnetic intensity [19,20,21].

Chemical displacement:

The chemical shift in nuclear magnetic resonance (NMR) spectroscopy is the value of the resonance tension of the atomic nucleus relative to a standard

value measured in the same magnetic field. The value of the chemical shift when analyzing chemical compounds by NMR spectroscopy is related to the structure of the molecule [22,23,24].

Materials, advices and method:

The water sample was prepared. It was placed in a file according to the following specifications:

$$R\approx \quad 0.6\ \Omega\ ,N=250\ ,L\approx 22mH I_{max}=5A$$

DC power supple = $0 \rightarrow 16V$ $\quad I=0 \rightarrow 5\ A$

Leybold Didactic spectromet ray 300nm

Made in USA 1150 nn

A magnetic field was applied to the water sample, then the coils were connected to an NMR spectrometer

NMR BETRIEB SOERT

NMR SUPPLY UNIT

The readings were taken via a USB device connection for display on a computer by changing the values of the light frequencies to record the absorption spectrum, changing the intensity of the magnetic field, and identifying the change in energy displacement and wavelength. Then the data was processed using Origin 8.6, version 6.

Results:

The graphs show the relationship between wavelength and the intensity of absorbed radiation, the relationship between frequency and the intensity of absorbed radiation, and also the relationship of chemical displacement with the magnetic intensity of water.

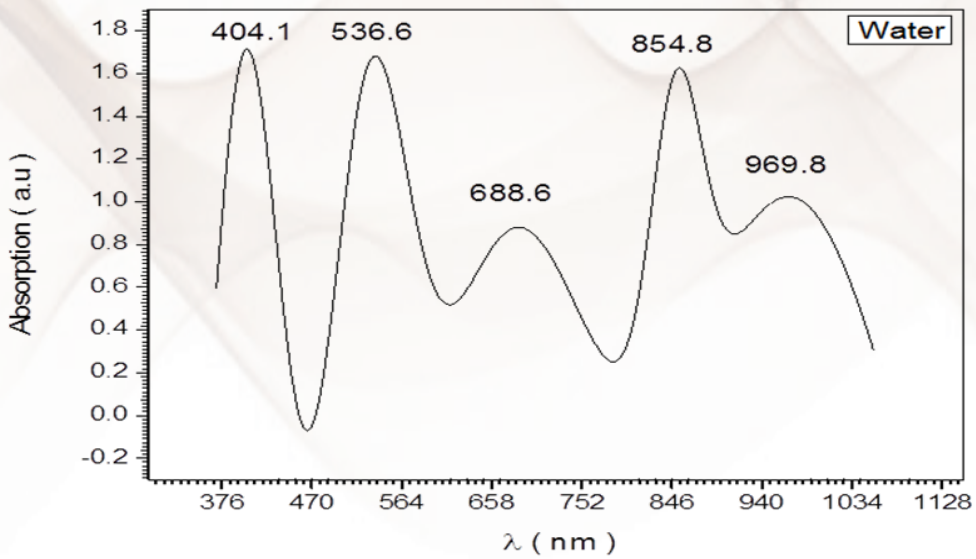

Figure (1) shows the relationship between wavelength and absorption for a water sample

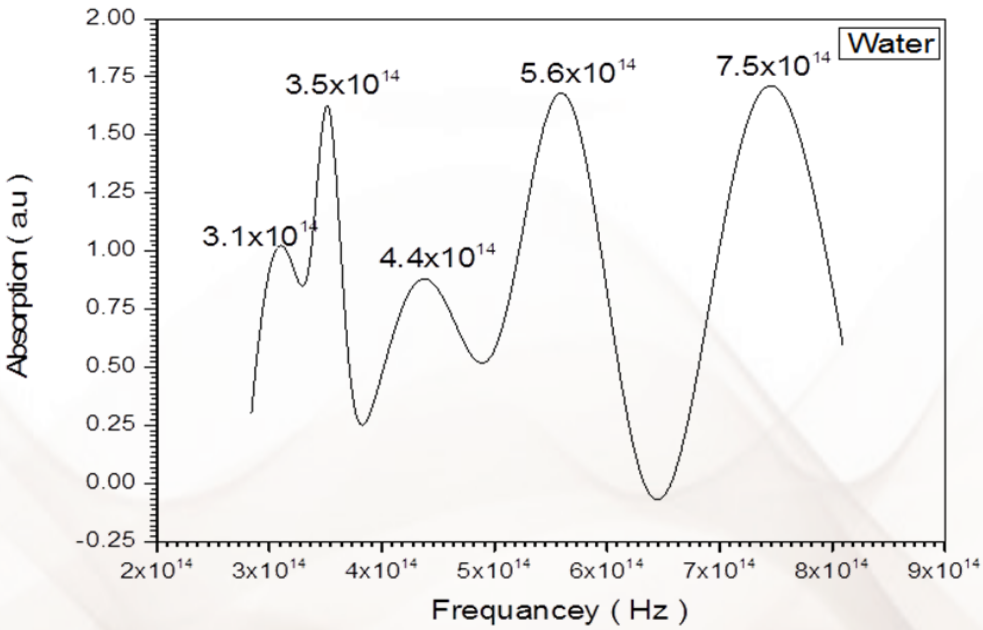

Figure (2) shows the relationship between frequency and absorption for a water sample

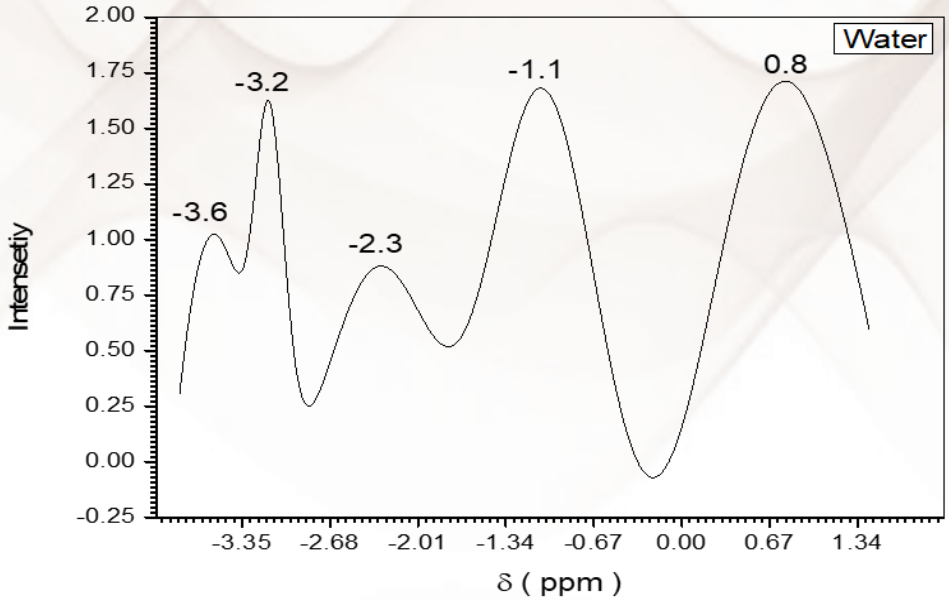

Figure (3) shows the relationship between chemical displacement and tension for a water sample

Discussion:

Looking at the figures (1) (2) (3) related to the absorption spectrum of the water sample, it is clear that absorption is at its maximum value at the wavelengths:

404.1nm, 536.6nm, 688.6nm, 854.8nm, 969.8nm . And at frequencies:

7.5×10^{14} HZ و 5.6×10^{14} HZ و 4.4×10^{14} HZ و 3.5×10^{14} HZ و 3.1×10^{14} HZ

When an external magnetic field is applied, the chemical displacement of energy is -3.6, -3.2, -2.3, -1.1, and 0.8 for intensities of 1, 1.60, 0.80, 1.70, and 1.72 Tesla, respectively. This shows that there is a direct proportionality between the chemical displacement and the intensity of the magnetic field, and this is consistent with The following theoretical equation:

$$\Delta E = E_{+} - E_{-} = \hbar\omega = g m_s \beta H$$

Conclusion:

This research shows that the absorption spectrum of water gives information about the electronic transitions allowed when visible light is shined on it. It also shows that the magnetic field causes a change in chemical displacement, and that there is a direct relationship between chemical displacement and the intensity of the magnetic field.

Recommendations:

The absorption spectrum and chemical displacement resulting from the application of a magnetic field to more compounds can be studied, and new theoretical relationships can be deduced to explain the phenomenon of chemical displacement.

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