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De Broglie waves, the Schrödinger equation and relativity II: Adhered photon hypotheses

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According to Lévy-Leblond ["Nonrelativistic Particles and Wave Equations," Commun. math. Phys. **6**, 286, (1967)], it is shown that spin is not the relativistic effect. Schrödinger formulation (i.e., dispersion relation excluding rest mass energy) shows quantum mechanics is free from relativity. Furthermore, de Broglie wave is proposed to be adhered photon.

1. Introduction

In 1928, Dirac[1] derived Dirac equation from Klein-Gordon equation which has dispersion relation including rest mass energy mc^2. Therefore, Klein-Gordon as well as Dirac equations were considered to be relativistic. Dirac equation derived spins; thus, it was believed that spin is relativistic phenomena. I do not consider it is the case.

In 1967, Lévy-Leblond[2] derived nonrelativistic Dirac equations from Schrödinger equation. Lévy-Leblond made linearization of the Schrödinger equation describing that "We shall now derive such a wave equation, which will turn out to describe spin 1/2 particles, using the heuristic idea that DIRAC applied so successfully in RQM;" where, linearization means transforming the second order space differential equation into a first order space differential equation using matrix.

Sidharth[3] noted that Dirac unite special relativity and quantum theory through his Dirac equation, and proposed the reverse way: how to derive special relativity from quantum theory. It is interesting; however, I do not consider it is the case. This is because from Lévy-Leblond equation, special relativity cannot be derived.

In this short note, we show from spin derivation by Lévy-Leblond that spin is not the relativistic effect. Adhered photon hypothesis is proposed to visualize de Broglie wave.

2. Exclusion of rest mass energy

2.1 Schrödinger equation and de Broglie wave[4]

In his doctoral thesis, de Broglie[5] noted that kinetic energy E_K is the difference between the relativistic energy γmc^2 and the rest mass energy mc^2 (γ is the Lorentz factor, m is the rest mass, and c is the speed of light),

$$E_K = (\gamma - 1)mc^2. \quad (1)$$

De Broglie represented both the wave energy and rest mass energy, while Schrödinger used only the kinetic energy in equation (1). Schrödinger used $E=p^2/2m$ and not $E=p^2/2m+mc^2$, which is the difference between de Broglie waves and the Schrödinger equation.

$Ac^- \equiv CH_3COO^-$

$HAc \rightleftarrows H^+ + Ac^- \qquad lg\,K = -4{,}76$

$H^+ + OH^- \rightleftarrows H_2O \qquad lg\,K = 14$

$HAc + OH^- \rightleftarrows H_2O + Ac^- \qquad lg\,K = 9{,}24$

$Ac^- + H_2O \rightleftarrows HAc + OH^- \qquad lg\,K = -9{,}24$

I am extremely small to be considered

BUT

Let's proceed

	Ac^-	HAc	OH^-
I	0,1	0,1	–
C	−x	x	x
E	0,1−x	0,1+x	x

$$K = \frac{[OH^-][HAc]}{[Ac^-]} = \frac{x(0{,}1+x)}{0{,}1-x} = 10^{-9{,}24}$$

$$x^2 + 0{,}1x = 10^{-9{,}24}(0{,}1-x)$$

$$x^2 + 0{,}1x = 10^{-10{,}24} - 10^{-9{,}24}x$$

$$x^2 + (0{,}1x + 10^{-9{,}24}x) - 10^{-10{,}24} = 0$$

$$D = b^2 - 4ac = (0{,}1 + 10^{-9{,}24})^2 + 4 \cdot 10^{-10{,}24} =$$

$$= 0{,}0100000000115088 + 2{,}30176 \cdot 10^{-10} =$$

$$= (0{,}1000000017 2632)^2$$

$$x = \frac{-b+\sqrt{D}}{2} = \frac{-(0{,}1+10^{-9{,}24}) + 0{,}10000000172632}{2} =$$

$$= \boxed{5{,}7544 \cdot 10^{-10}}$$

Quím. Nova, Vol. XY, No. 00, 1-3, 200_ doi number

Educação

ACETANILIDA: SÍNTESE VERDE SEM SOLVENTE

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Recebido em 16/01/2015; aceito em 10/03/2015; publicado na web em 08/05/2015

ACETANILIDE: SOLVENT-FREE GREEN SYNTHESIS. We described herein a solvent-free synthesis of acetanilide developed in the context of green chemistry. The synthetic approach consisted of the reaction of aniline with acetic anhydride without additives, while using smaller amounts of reagents and water than previously described for this undergraduate experiment. The E Factor was 0.6 by experienced chemists and 0.9 by students.

Keywords: green chemistry; acetanilide; aniline; undergraduate organic chemistry experiment; solventless reaction.

INTRODUÇÃO

Algumas substâncias orgânicas são emblemáticas na formação dos químicos. Umas por seu emprego recorrente na explicação de aspectos teóricos, como o ácido acético e o benzeno; outras por, inexoravelmente, fazerem parte da formação experimental, como o ácido acetilsalicílico e a acetanilida. Não é exagero afirmar que, desde a segunda metade do século XX, todo químico sintetizou a acetanilida num dado momento da sua formação acadêmica e, como exemplo, na Figura 1 é apresentada a folha de rosto de um caderno de laboratório típico de graduando, descrendo a sua preparação, anterior à disseminação do computador, da internet e do advento da Química Verde,[1-9] bem como exemplos de preparação da acetanilida em aula.[10-23]

A síntese da acetanilida é, portanto, um experimento clássico inserido na graduação como molécula alvo, Esquema 1.[10-20] Aplicações como intermediário sintético em miniprojetos de síntese são comuns,[18,21-22] mas é importante também seu emprego como padrão de calibração de aparelhos de determinação de ponto de fusão de substâncias orgânicas e, atualmente, de aparelhos de análise térmica.[24] Para exemplificar a estabilidade da acetanilida como padrão para estas finalidades, é apresentada na Figura 1S uma amostra original, sintetizada ha mais de 40 anos, ainda em uso.

É curiosa a trajetória da acetanilida nos manuais de ensino experimental. No livro mais antigo que tivemos acesso, o clássico Gattermann,[25] não consta sua preparação. O mesmo ocorre no livro recente de Pavia e colaboradores.[26] Nos demais textos consultados[11-23] predomina o emprego de anilina e anidrido acético como reagentes, na presença de ácido acético e acetato de sódio, que é um procedimento desfavorável na avaliação do Fator E quando comparado com o método que emprega água como solvente (1,7 versus 0,7, respectivamente).[9]

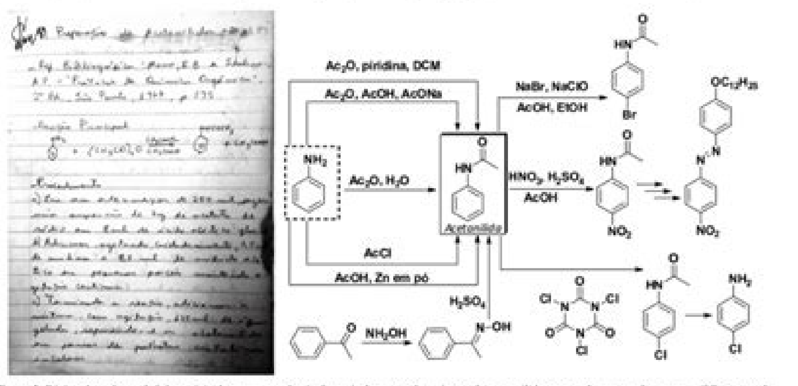
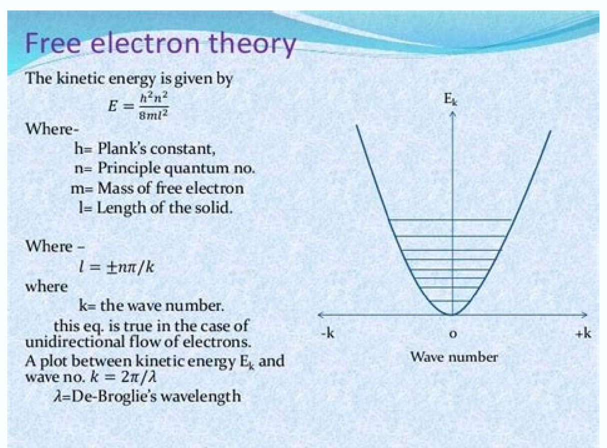


Figura 1. Página de caderno de laboratório de um quarto de século atrás descrevendo a síntese da acetanilida executada por um dos autores (SC) e exemplos de preparação e usos da acetanilida em miniprojetos de síntese para aulas[10-13]

*e-mail: silviodc@ufba.br



$$\mathrm{pH} = \mathrm{p}K_a + \log\left(\frac{[base]}{[acido]}\right)$$

$$\mathrm{pOH} = \mathrm{p}K_b + \log\left(\frac{[sal]}{[base]}\right)$$

$$\mathrm{pH} = \mathrm{p}K_x + \log\left(\frac{[S]}{[A]}\right)$$

De broglie wavelength formula calculator. De broglie's wave equation calculator. De broglie wavelength equation calculator. De broglie's equation calculator.

Explore more from General Science here. Loading PreviewSorry, preview is currently unavailable. According to de Broglie, an electron of mass 'm' moving with a velocity 'v' should be associated with a wave having wave length (lambda). (7) becomes as ...(8) Where m is the mass, v the velocity, l the wave length and p the momentum of an electron. From equation (8), we get l = h/mv ...(10) Substituting the value of l in equation (9), we get or ... (11) Which is the same as Bohr's second postulate. Expert online chemistry tutors at Assignmenthelp.net provide all sorts of help regarding your problems in chemistry(de-broglie's hypothesis, atomic structure) through e-mail and live chat. So, g is converted to kg. Equation is known as de Broglie relationship and can be written as or mv µ ...(2) Equation (2) is another form of de Broglie relationship and this can be stated in words as "The momentum of a moving particle is inversely proportional to the wave-length of the waves associated with it." Let us first consider the case of a photon. Thank you very much for your cooperation. in pm. If the circumference is bigger or smaller than the value as given by equation (11), it means that the wave is not in the phase as shown in figure(2). Answer (Detailed Solution Below) 39.6 - 40.5 Free 10 Questions 16 Marks 30 Mins Explanation: de Broglie wavelength of electrons: Louis de Broglie theorized that not only light possesses both wave and particle properties, but rather particles with mass - such as electrons - do as well,i.e. matter has dual nature. Learn now! India's #1 Learning Platform Start Complete Exam Preparation Daily Live MasterClasses Practice Question Bank Mock Tests & Quizzes Get Started for Free Download App Trusted by 2,78,48,510+ Students In order to continue enjoying our site, we ask that you confirm your identity as a human. It means that electron is not a mass particle moving in a circular path but is instead a standing wave train (non-energy, radiating motion) extending around the nucleus in the circular path as shown below: For the wave to remain continually in phase, the circumference of the orbit should be an integral multiple of wavelength l i.e., 2pr = nl ...(9) Where r is the radius of the orbit and n is a whole number. Thus, de-Broglie relation provides a theoretical basis for the Bohr's second postulate. Calculation: Given: The speed of Argon atom = 250 m s−1 h = 6.626 × 10−34 kg m2 s −1 Mass of Argon = 40 amu = 40 g/mol The wavelength of argon =? Let's discuss the concepts related to Chemistry and Structure of Atom. From equation (11) it follows that "Electron can move only in such orbits for which the angular momentum must be an integral multiple of h/2p. Hence, the wavelength of the argon atom is 39.9 pm. Waves are dispersed over a wide region and not confined. To schedule a Chemistry (De-Broglie's Hypothesis) tutoring session Live chat To submit Chemistry Courses Click here Following are some of the topics in Chemistry (Atomic Structure, De-Broglie's Hypothesis) in which we provide assignment/homework help: NOTE: We have to find the wavelength in picometers, so we have to convert everything into the same units before calculation. Assignmenthelp.net's Services – ready to help students around the clock (24/7 technical support) Live Supports by Phone, Chat or E-mail (support@assignmenthelp.net). You can download the paper by clicking the button above. Considering Einstein's relationship of wavelength lambda to momentum p, de Broglie proposed that this relationship would determine the wavelength of any matter, in the relationship: lambda = h / p Where h is Planck's constant and p is momentum. This wavelength is called the de Broglie wavelength. The assignments, we provide is plagiarism free and offer free download facility of Chemistry/Physics tutorials as well. Equation (8) is same as equation (1). Hence, the wavelength = \(\lambda = \rm \frac{{6.626{\rm{ }} × \;10^{ - 34} \ kg m^2 s ^{−1}}}{{250m/s × 40 × 10^ {- 3} \ kgmol^{-1}}}\) Now, for converting moles to numbers, we have to divide the atomic mass of Argon by Avogadro's number, so the equation becomes: \(\rm \lambda = \frac{{6.626{\rm{ }} × \;10^{ - 34} \ kg m^2 \ s ^{−1}6.022 × 10^{23}mol^{-1}}}{{250m/s × 40 × 10^ {- 3} \ kgmol^{-1}}}\) The value of wavelength now comes as: 00399 × 10-8 m = 39.9 × 1012 m = 39.9 pm. de Broglie wavelength (λ) of electrons can be calculated from Plancks constant h divided by the momentum of the particle So, according to de Broglie, every object has a dual nature- a particle and a wave nature whose wavelength is given by \(\lambda = \frac{h}{{mv}}\) or \(\lambda = {h\over p};p=mv\) where m is the mass of the particle,v is the velocity of the particles and h is the Planck's constant. The wave nature is predominant in particles of small mass like electrons and negligible in bodies of large masses. This wave length and velocity are related by the following mathematical equation => ...(1) Where h is the Planck's constant and mv is the momentum of the moving particle. If we consider it to be a wave of frequency n, its energy is given by E = hn ...(3) If we now consider it as a particle of mass m, its energy is given by E = mc2 ...(4) From equation (3) and (4), we get hn = mc2 ...(5) As the photon travels in free space with velocity of light c, its momentum p is given by P = mass ´ velocity = mc ...(6) On dividing equation (5) by (6), we get or [c = vl = Frequency ´ wave length] or ...(7) de-Broglie assumed that the above relation holds good for material particles like electrons, and hence for electrons eq. Application of the de-Broglie's relationship to a moving electron around a nucleus puts some restrictions on the size of orbits. The wavelength of material waves is also known as the de Broglie wavelength. The French physicist Louis de Broglie made a bold assertion in 1923.

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