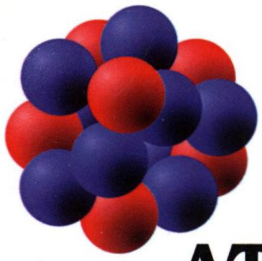
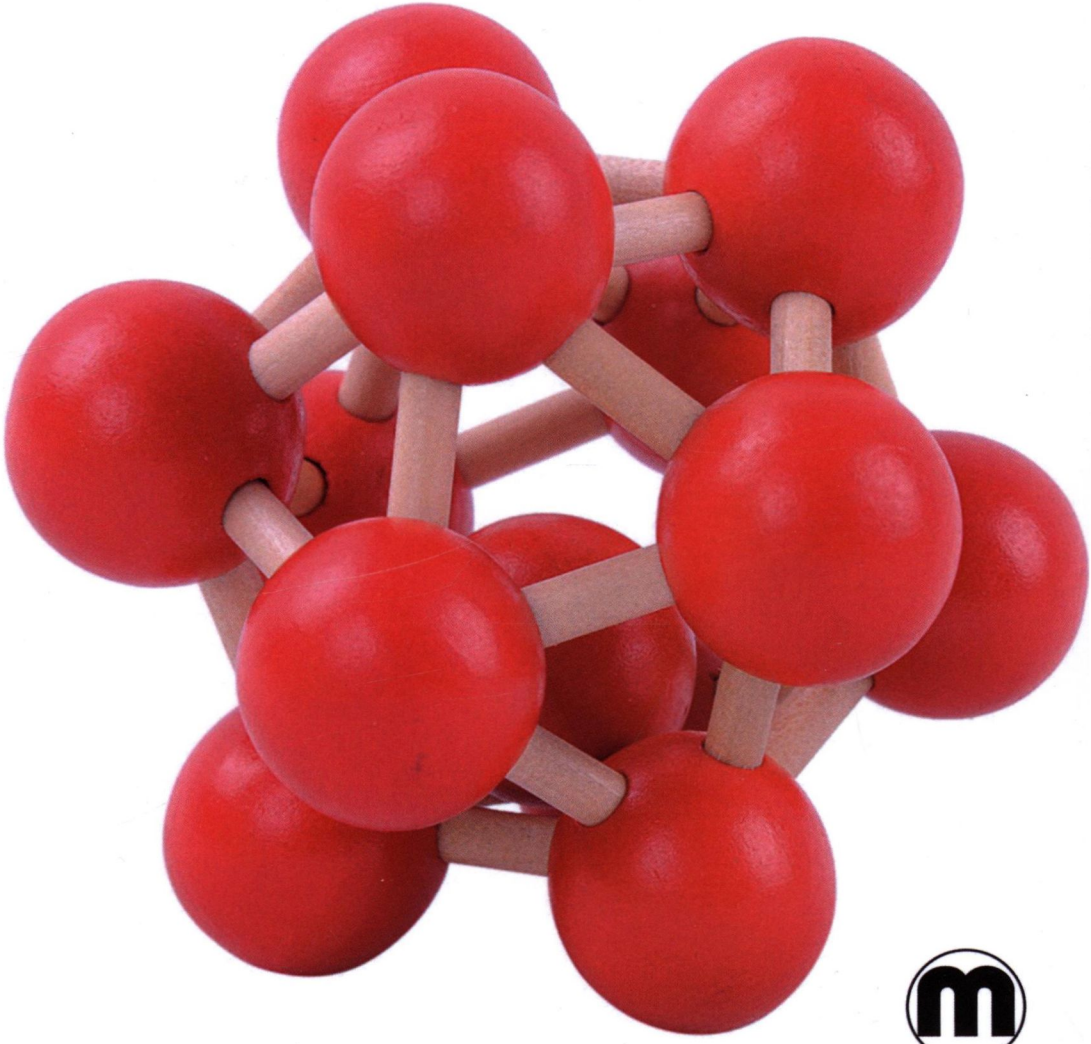


ATOMIC SPECTRA and ATOMIC STRUCTURE

Leo Tolstoy



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Atomic Spectra and Atomic Structure

Atomic spectra are defined as the spectrum of frequencies of electromagnetic radiation emitted or absorbed during transitions of electrons between energy levels within an atom. Each element has a characteristic spectrum by which it can be recognized. Atomic structure is the concept of an atom as a central positively charged nucleus consisting of protons and neutrons surrounded by a number of electrons. The number of electrons is equal to the number of protons: the whole entity is thus electrically neutral.

In first chapter, the model of motion of single electron in electric field of an atomic nucleus as in external central electric field has been developed. Second chapter deals with atomic regular polyhedron electronic shell. In third chapter, we perform the self-consistent calculations on the atomic electron affinity and ionization energy for the first-row atoms by means of our scheme. Fourth chapter focuses on XRD characterization of AlN thin films prepared by reactive RF-sputter deposition. In fifth chapter, we begin with the general relativistic field equations describing flat spacetime, but stimulated by vacuum energy fluctuations. A selection of aspects, which play a role in modern computational theory of solids, has been given in sixth chapter. Seventh chapter focuses on atomic structure of graphene and h-BN layers and their interactions with metals. Atomic layer deposition on self-assembled-monolayers has been outlined in eighth chapter. Detailed analysis of configuration interaction and calculation of radiative transition rates in seven time's ionized tungsten have been proposed in ninth chapter. Tenth chapter focuses mainly on metal- ceramic interfaces, but other inorganic crystalline interfaces are partly included because their principles are similar, while organic materials are excluded. In last chapter, we summarize our results obtained on W VIII and its isoelectronic spectra with an emphasis on the main trends along the isoelectronic sequence.

Leo Tolstoy has received Ph.D. in Chemistry. He has written numerous research papers on electronic structure, atomic spectra, and geometry of molecules. His main contributions are to the field of atomic and molecular spectroscopy.

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Atomic Spectra and Atomic Structure

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Preface

Atomic spectra are defined as the spectrum of frequencies of electromagnetic radiation emitted or absorbed during transitions of electrons between energy levels within an atom. Each element has a characteristic spectrum by which it can be recognized. Atomic structure is the concept of an atom as a central positively charged nucleus consisting of protons and neutrons surrounded by a number of electrons. The number of electrons is equal to the number of protons: the whole entity is thus electrically neutral.

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Editors

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MOTION CHARACTERISTICS OF SINGLE ELECTRONS OF ATOMS OF ATOMIC GAS OF HYDROGEN AND SINGLE ELECTRONS OF HYDROGEN-LIKE IONS IN FORM GAS OR VAPOUR DURING DECAYS OF SUCH ATOMS AND IONS. EMISSION LINE SPECTRA

Ivan Antonovych Strilets

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ABSTRACT

For the first time the vector differential equation of central motion of single electron in electric field of an atomic nucleus as in external central electric field is set up and solved. Here the following findings are reported. Each of single electrons of a part of atoms of atomic gas of hydrogen and a part of hydrogen-like ions in the form of a gas or a vapour revolves around corresponding atomic nucleus in a flat spiral which has an interior maximum of turns density. The distance between each of these single electrons and corresponding atomic nucleus increases while a speed of single electron decreases. Such motion of single electrons takes place with no expenditures of external energy and points to decays of foregoing parts of atoms and ions. The electric field strength of the atomic nuclei of atoms of atomic gas of hydrogen and hydrogen-like ions in the form of a gas or a vapour is inversely proportional to the distance between the atomic nucleus and the corresponding single electron by greater than the power of 3. Calculated cyclic frequency (rough value $3.5\times10^{14}\ \mathrm{s}^{-1}$) of revolution of the electron around the nucleus of atom of atomic gas of hydrogen (in interior maximum of turns density of the flat spiral), which moves at speed $2.2\times10^{6}\ \mathrm{ms}^{-1}$, and central cyclic frequency of α-line of Balmer series $\left(4.5\times10^{14}\ \mathrm{s}^{-1}\right)$ have the same order

of magnitude. This fact and line structure of experimental emission line spectra confirm the formation of all lines of these spectra by continuous slight emission of light front by single electrons. The formation of series of lines of emission line spectra is linked to repeated creations of atoms of atomic gas of hydrogen and hydrogen-like ions in the form of a gas or a vapour.

INTRODUCTION

Atomic gas of hydrogen (atomic hydrogen) and hydrogen-like ions in the form of a gas or a vapour have been used for experimental study of emission line spectra (see e.g. [1]). Theory of these spectra was proposed by N. Bohr (1913) and developed in quantum mechanics and quantum electrodynamics.

However phenomena of atomic physics and optics have been described not only by quantum theory. Generally known example [1] is Cerenkov radiation (1934), which was interpreted on the basis of classical electrodynamics. This effect applies to slight emission of light front in the form of a conical surface by charged particles (for example, by electrons), passing through a transparent medium at a speed greater than the speed of light in that medium. According to [1] the effect is similar to that of a sonic boom when an object moves faster than the speed of sound.

In our time at the end of XX century the effect of substantial reduction of light speed in atomic gas of Na with the high atomic density was discovered [2] .

The discoveries of Cerenkov radiation and afore-named effect of substantial reduction of speed of light give ground for a new research of emission line spectra with such supposition. I have supposed that a speed of single electrons of atoms of atomic gas of hydrogen and a speed of single electrons of hydrogen-like ions in the form of a gas or a vapour are greater than the speed of light in electric field of corresponding atomic nuclei. Consequently, these single electrons, moving around atomic nuclei, simultaneously emit slight light front in the form of a conical surface (like Cerenkov radiation), i.e., form a line of emission line spectrum.

In order to establish fact of formation of a line and identify the way of formation of series of lines with slight emission of light front by single electrons a necessity appeared to find out the motion characteristics of single electron (especially the characteristics of its velocity) in electric field of an atomic nucleus. As far as I know these characteristics with a strict physical and mathematical argumentations have never been ascertained.