Thematic Section: Fundamental Research. **Full Paper**
Subsection: Theory of the Matter Structure. *The Reference Object Identifier* – ROI: jbc-01/19-58-4-1
The Digital Object Identifier – DOI: 10.37952/ROI-jbc-01/19-58-4-1
Submitted on April 25, 2019.

Theoretical and empirical justification of hydrogen atom planetary model

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Keywords: hydrogen atom, planetary model, atomic constants, stability.

Abstract

The basis for the hydrogen atom planetary model, which represents the development of the Rutherford-Bohr atom model, is presented. The measurements of the atom polarizability, radius, electric and magnetic moments, as well as the Stark and Zeeman effects are given as an argument. The central paragraph of the Article is a comparison of the binding energy obtained based on wave measurement data (the Rydberg constant) and the binding energy obtained by calculation according to the data of the electron charge and mass fundamental constants and applying the principle of momentum conservation. The substantiation of the atom stability is given proceeding from the atom planetary model. The nature and mechanism of the optical spectrum formation is discussed. The substantiation of the fine structure of the hydrogen atom spectral lines is presented, proceeding from the fundamental association between the electric field strength of the electron charge and the speed of its velocity. The origin of the optical spectrum hyperfine structure is discussed within the planetary model.

The difficulty in constructing an acceptable theory of the electronic structure of atoms is primarily due to the complexity of obtaining direct information on the atoms internal structure. The point is that the outermost electron shell of an atom behaves itself like an effective screen for external probing electrical fields. This circumstance sharply limits the possibilities of experimental methods for studying the intra-atomic structure. On the other hand, it is imperative that the research methods being employed be non-destructive ones in order to obtain reliable information concerning the structure of atoms. This means that the action on the atom during measurement process must meet the condition of the electron shell perturbation smallness of the atom or ion being investigated. Concerns associated with the inaccessibility of the electronic structure of atoms served as a pretext for a conclusion of the limited possibilities of the empirical method of knowing the internal structure of atoms at the proper time.

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