

Quantum-Mechanical Principles of the Construction of the Theory of Nuclear-Molecular Catalysis for Proton-Proton Reaction which Proceeds in Interiors of the Sun and of the Other Dwarf Stars Located at the Bottom of the Main Sequence

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A new model of hydrogen chain of solar thermonuclear reactions is investigated. The initial pp -reaction in this new model takes place through the nuclear-molecular catalysis (NMC). The catalyst is the ${}^4\text{He}$ nucleus, which with protons together forms nuclear-molecular activated complexes (NMAC) [${}^9\text{Be}^*$], [${}^{10}\text{C}^*$], etc. In order to understand the physical essence of the new phenomena, the ultimate versions of NMAK – one-dimensional and two-dimensional nuclear-molecular crystals – are considered. The “generalized” Bloch’s theorem and the theory of Bardeen, Cooper, Shriver (BCS) are the theoretical basis of the study. An important result of the proposed model is the formation of Cooper proton pairs that produce the cumulating process of overcoming a Coulomb barrier discussed earlier.

Primary author(s) : Dr. KOPYSOV, Yuri (INR RAS)

Presenter(s) : Dr. KOPYSOV, Yuri (INR RAS)

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