ДАГЕСТАНСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ

Филипп Иванович Высикайло

XI ВСЕРОССИЙСКАЯ КОНФЕРЕНЦИЯ ПО ФИЗИЧЕСКОЙ ЭЛЕКТРОНИКЕ (ФЭ-2020)

Махачкала-Москва – 2020

Physical Alloying

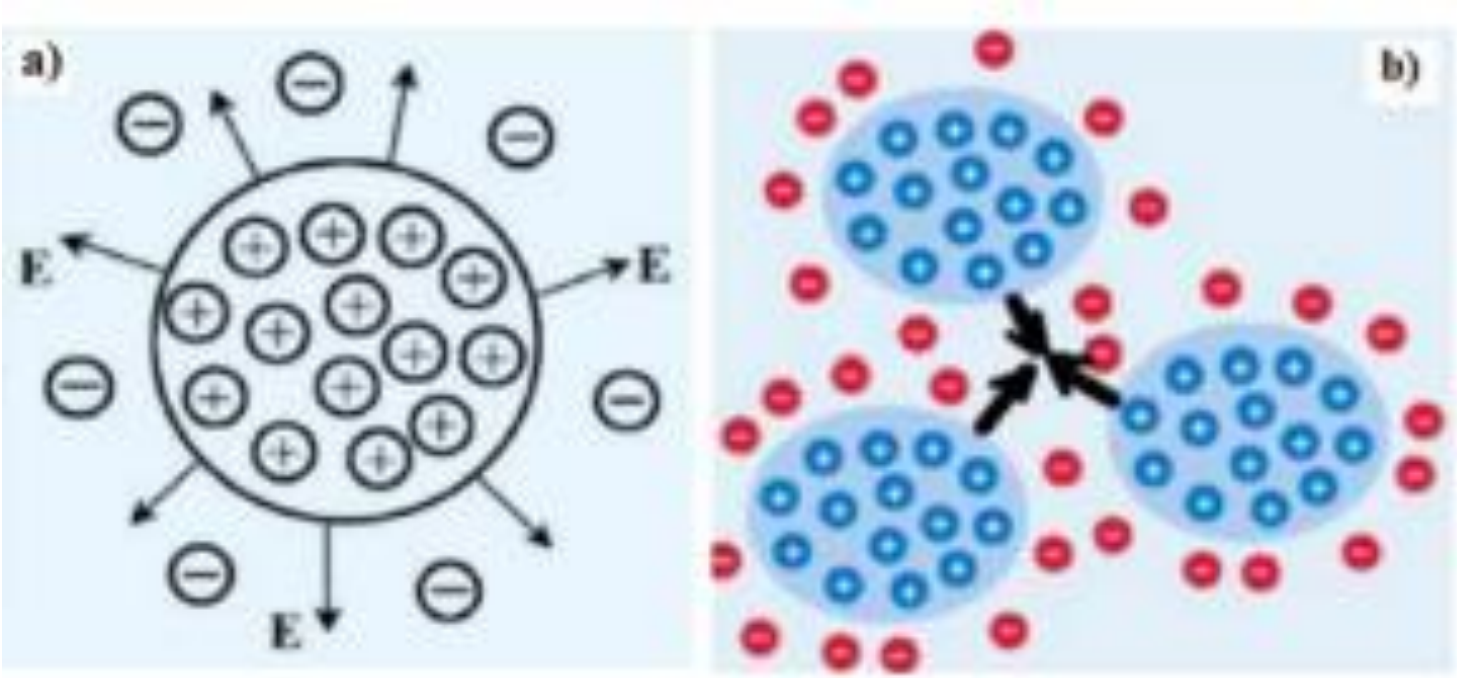


Fig. 1. The scheme of physical doping of nanocrystals with quantum resonators for de Broglie waves of electrons [3]. (a) The charge structuring is caused by the capture of electrons by traps-quantum resonators. "+"– a positively charged nanocrystal; "-" – a quantum resonator that physically alloys the nanocrystal. As the concentration of traps increases, the electric field of the nanocrystal and the energy of electrons in its region increases. This increases the efficiency of phosphors. (b) The arrows show the Coulomb compression forces due to the structuring of the volume charge.

Cumulative polarization electron capture

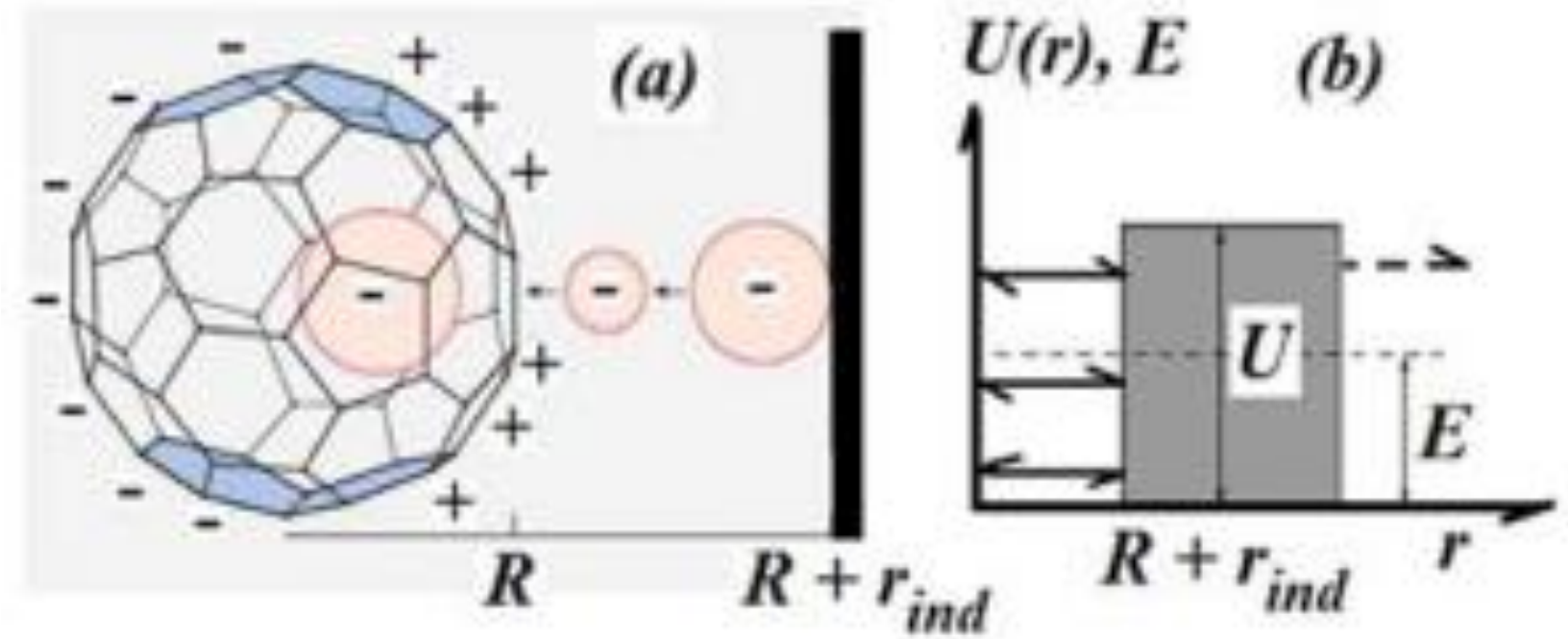


Fig. 2. The scheme of the cumulative polarization electron capture with the resonant energy from 0.24 to 20 eV into a hollow C 60,70 molecules [3]. The endoion radius (the location of reflecting «mirror» R i = (R C60, C70 + r ind).
(a) The 4D space-time process of formation of a standing de Broglie wave in a polarizing quantum resonator.
(b) The diagram of a metastable (quasi-open) quantum particle with the polarization mirror (of finite size), which captures the electron with energy E > 0 into the polarization trap of the characteristic size R + r ind . The polarization mirror is darkend. This problem is the first Helmholtz boundary value problem [13, p. 515].

Vysikaylo'concentration-quantum-size effect of the second type

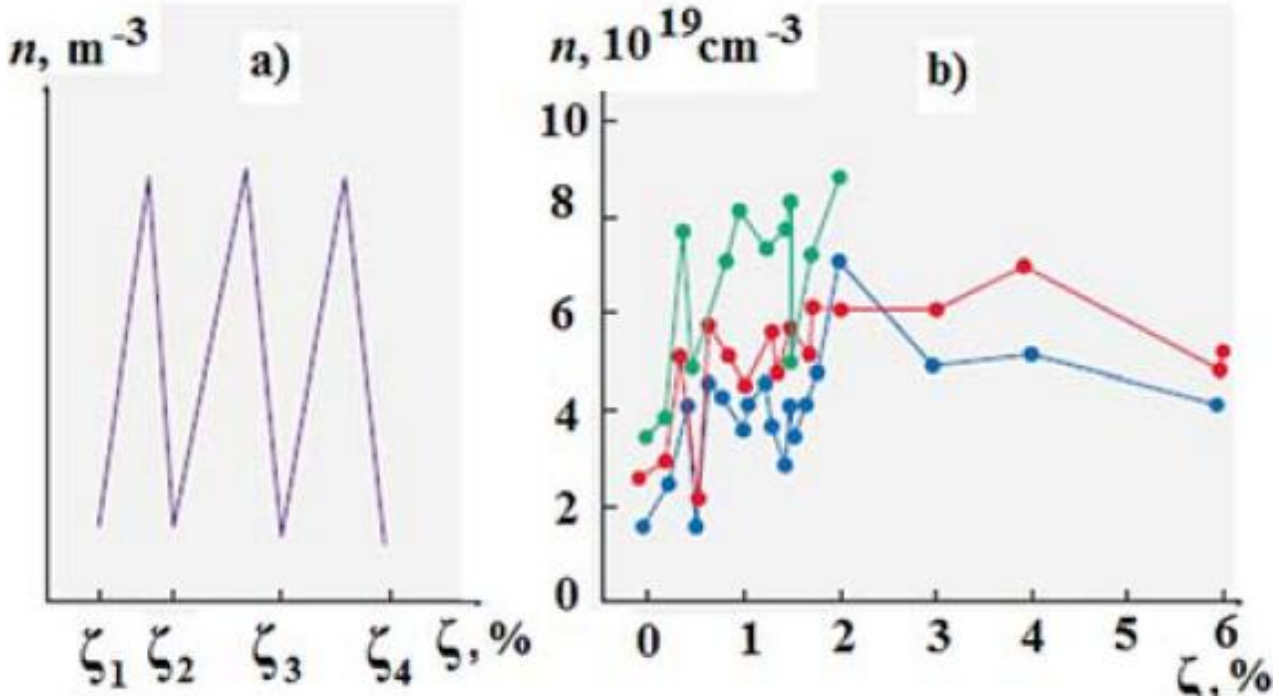


Fig. 3. The Vysikaylo'concentration-quantum-size effect of the second type: (a) – the manifestation of the quantum-size effect in macroscopic parameters of the nanocomposite, due to polarization capture of electrons by polarized hollow molecules. A characteristic dependence of the nanocomposite parameters, for example, the concentration of ions or electrons n on the volume content of C 60 quantum resonators in the composite. The profiles shift with a change in the characteristic radius of the nanocrystallites, forming with a relative concentration of traps a quantum-sized pair that changes the parameters of the nanostructured composite in the mesomir [3, 9]; (b) – the results of experimental measurements of the resonance profiles of the electron concentration with a change in the relative concentration of traps upon doping with C 60 fullerenes of nanocrystals of semiconductors (thermoelectrics) at various temperatures (from 295 to 77 K). The characteristic radius of nanocrystallites after annealing is R ≈ 17 nm [9].

Cumulative quantum mechanics (QCM)

- We have proposed a foundation of cumulative quantum mechanics (QCM) that allows one to describe the resonance cos-waves with the ψ (n-1/2) function of an electron (ψ (n-1/2,r) ~ cos (k (n-1/2)*r)/r ↑k) unlimited (with k ≠ 0) in the nanoresonator center in hollow quantum nanoresonators with any type of symmetry (plane – k = 0, spherical – k = 1, and cylindrical – k = 0.5).

resonator center by the geometric normalization coefficient corresponding to the symmetry type and being $\chi(r) = 2^k \pi^{1/2} r^k$, at $k \neq 0$ (if $k = 0$, then $\chi = 1$). The stratification of the probability of finding the particle in the quantum nanoresonator volume is similarly determined by the energy of a particle or a full set of squares of the corresponding quantum numbers ($(n\text{-}1/2)^2$ for cos-waves and n^2 for sin-waves) for any

Probability to find an electron in hollow molecule

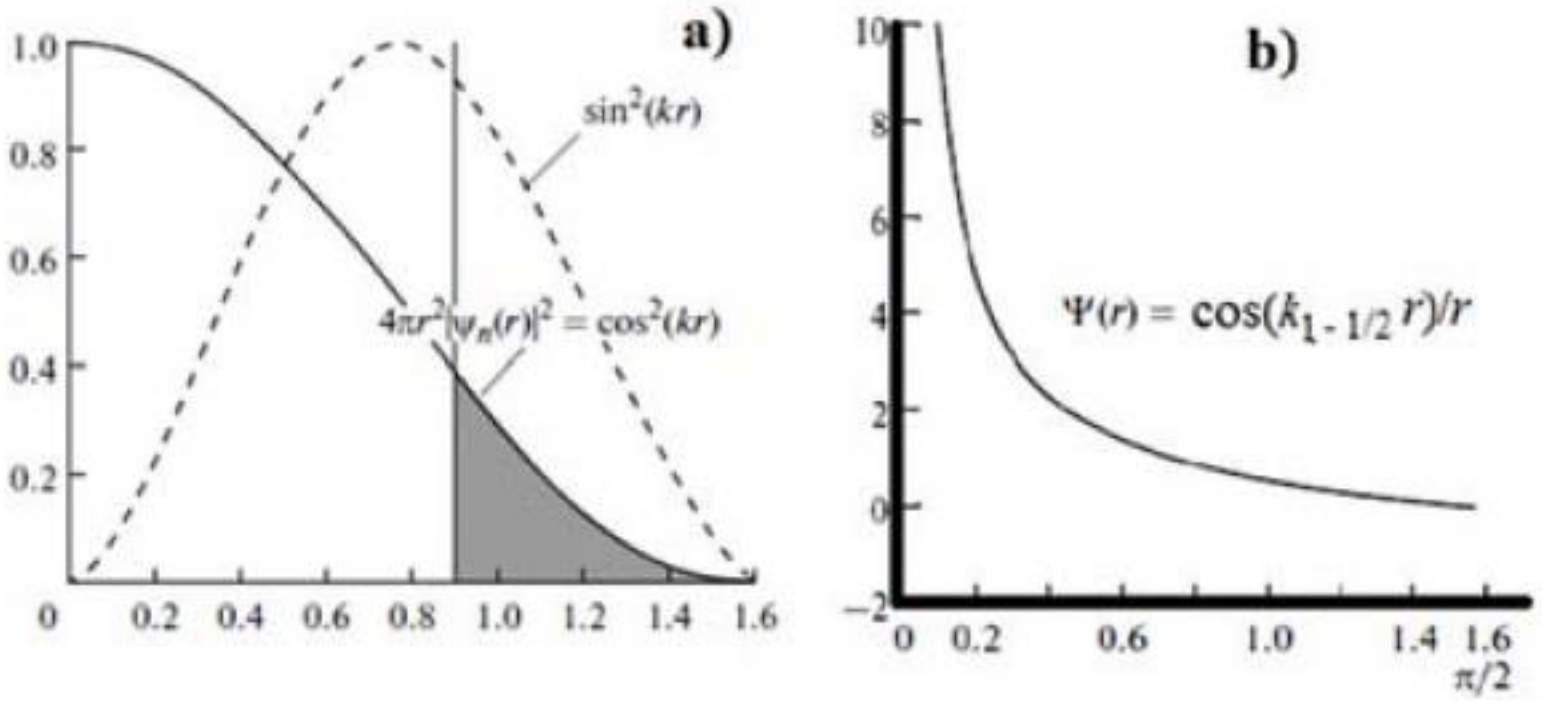


Fig. 4. (a) The probability to find an electron in the region of a hollow spherically simmetric molecule versus the distence to its center for half-resonance (with E cos1) is denoted by the solid graph and for the wave-resonance (with E sin1) by the dotted graph. The relative probability of finding an electron at 1/2 resonance outside the C 60 shell is obscured.
(b) The ψ cos1 – cos(k (1-1/2)*r)/r function of the electron versus the distance to the hollow molecule center (r - in radians).

Cumulative-dissipative structures and L1-5 points

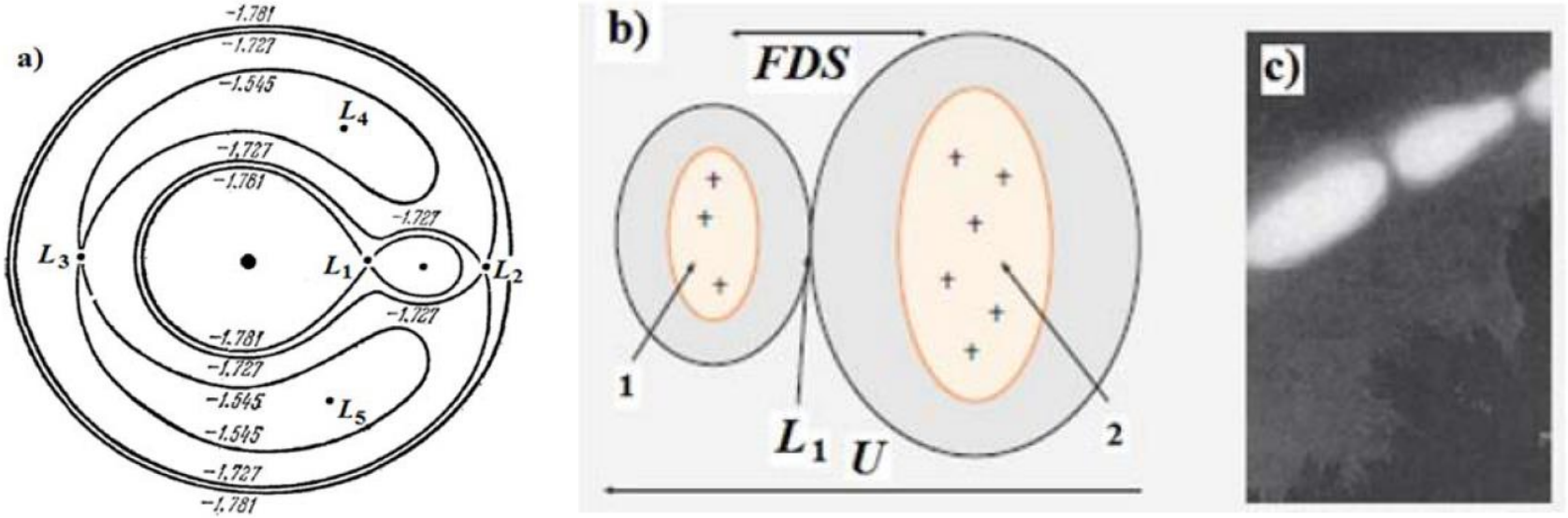


Fig. 6. Schemes of cumulative-dissipative structures:
(a) – this is a cross section of surfaces of equal potential (taking into account the centrifugal potential) in the Roche' model in the orbital plane of a double gravitational system. The points of libration L4,5 (Lagrange) and of cumulation L1-3 (Euler) are due to the interference of long-range non-local gravitational and centrifugal potentials;
(b) – cross-section of equal potentials according to the Vysikaylo-Roche' model [11] in the cross-section plane of two positively charged plasma structures.
L 1 – the point of accumulation of electron flows or focus for electrons; U – external drop of potential, the electrons in it move from point 1 to point 2; (c) – a vivid illustration of long-range convective nonlocality is clear lightning with points of cumulation of electron fluxes and Faraday dark spaces (FDS) between luminous, positively charged plasmoids [11].

Physical doping of nanocomposites

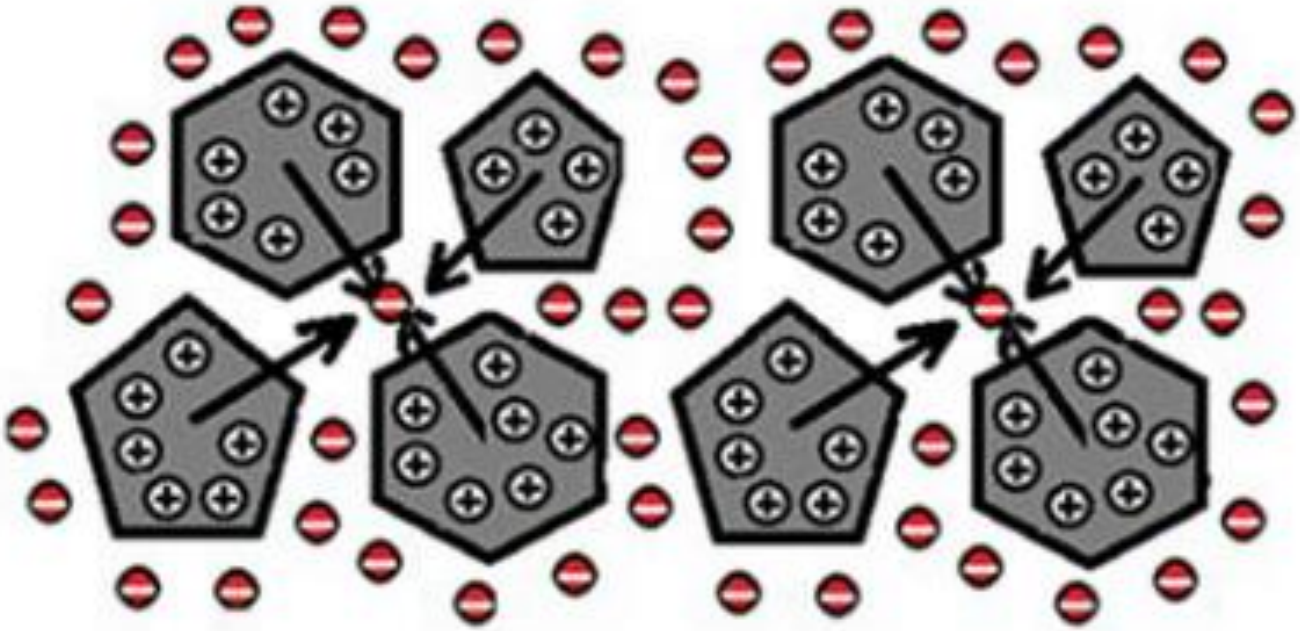


Fig. 7. The scheme of physical doping of nanocomposites (gray nanocrystals with "+") by carbon nanostructures (circles with "-"). Carbon nanostructures have an affinity for free electrons and are charged with a negative charge ("-"). The arrows indicate the direction of the Coulomb forces that compress the nanostructured polarized composite. Circles with the minus sign inside are the nanostructures with the captured electron. Circles with the positive sign inside correspond to a positive ion in the positive nanocrystal. Hexagons – MeC (nanostructures of carbide metal – Me). Pentagons – Me (nanostructures of metal).

Conclusions

The theory of quantum-size effects, developed by us in [3] and tested in [1, 2, 5, 6, 10, 12, 18, 19], including these experiments, successfully works for physically doped carbides (Figs. 1, 7). Thus, in [1, 5, 6, 8, 18], during physical doping of copper and in aluminum, hardening of materials in 10 times, to 10 GPa was obtained, and in the case of carbides in this work, we obtained up to 31 GPa. According to the theory [3], hardening of nano-composites is possible during physical doping with fullerene layers up to 100 GPa.

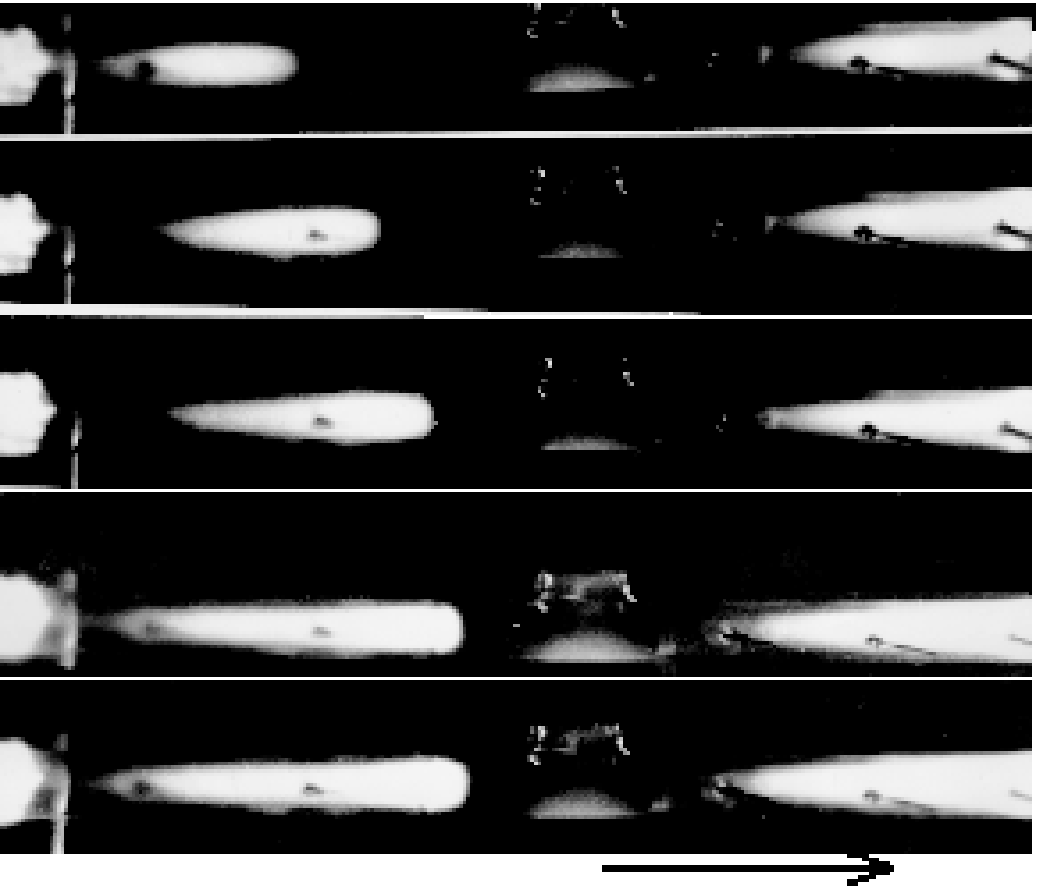
By varying the concentration of carbon nanotubes, it is possible to obtain materials with different rheological parameters and, accordingly, self-healing. By applying an electric current to the doped section of the borosiloxane self-healing coating, it is possible to increase the fluidity due to heating caused by the current of electrons in a medium with an electrical resistance of a given range. These parameters can be controlled not only by changing the concentration, but also by changing the degree of dispergation. The dispergation process in borosiloxanes can be intensified due to the possibility of using mixing in the modes of brittle and viscous destruction when creating a self-healing composite material.

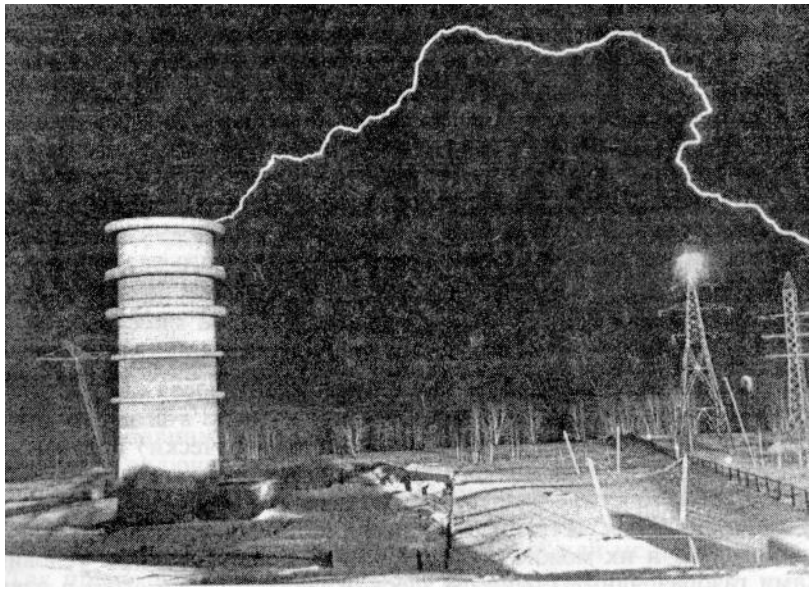
Thank you !

Send your questions by E-mail:
filvys@yandex.ru

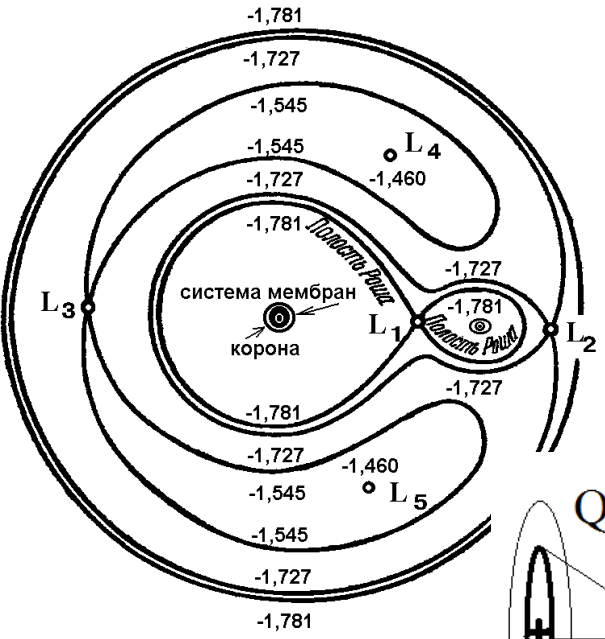
Philipp I. Vysikaylo

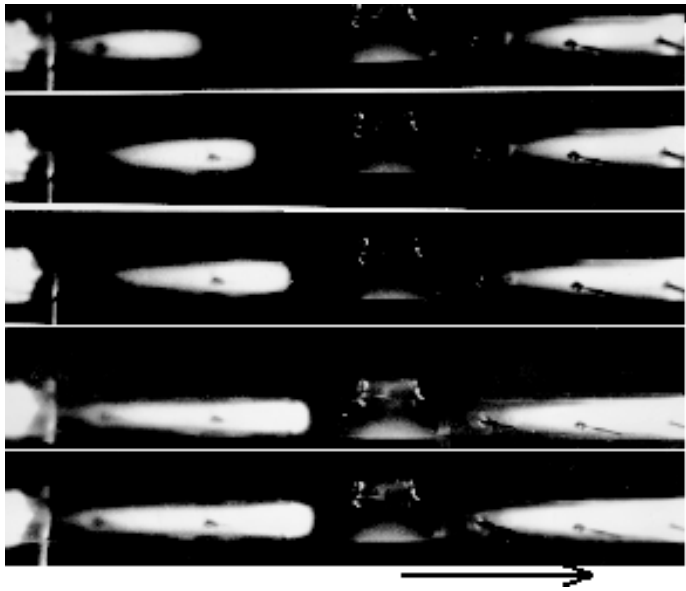
Открытие точек и линий кумуляции Высикайло-Эйлера в плазме

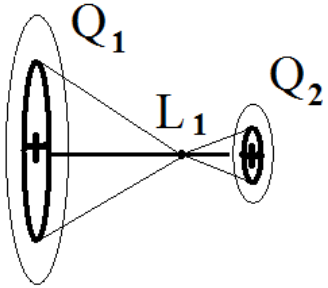


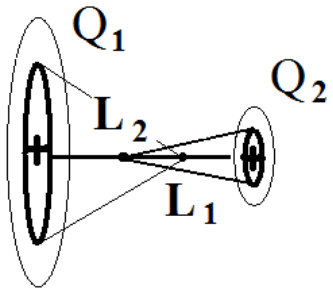


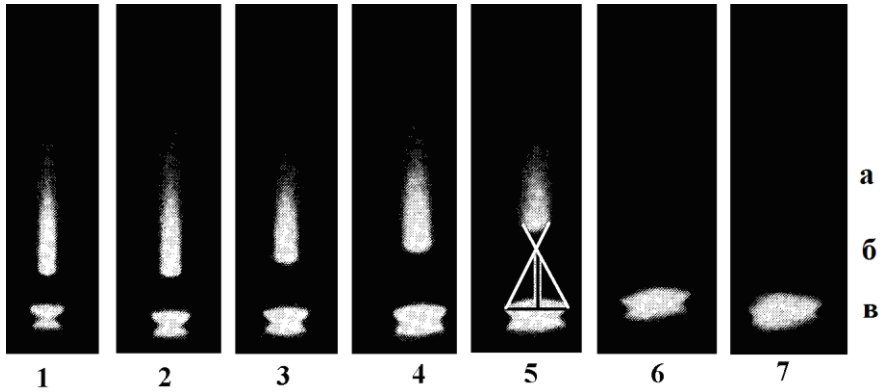
Демонстрация и обсуждение аналогов

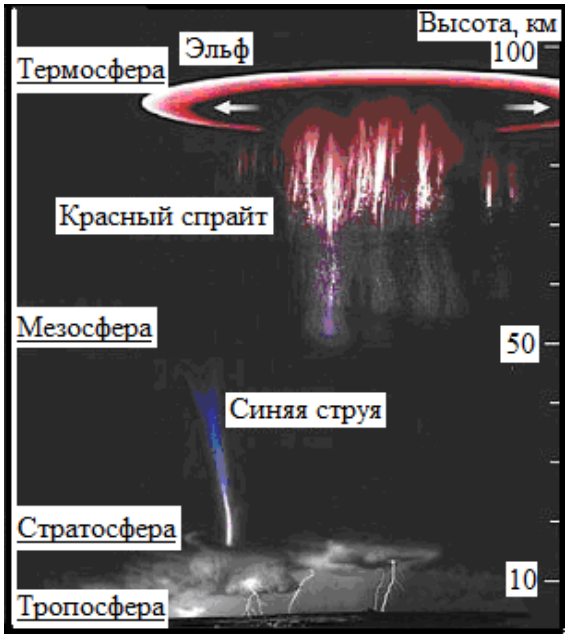




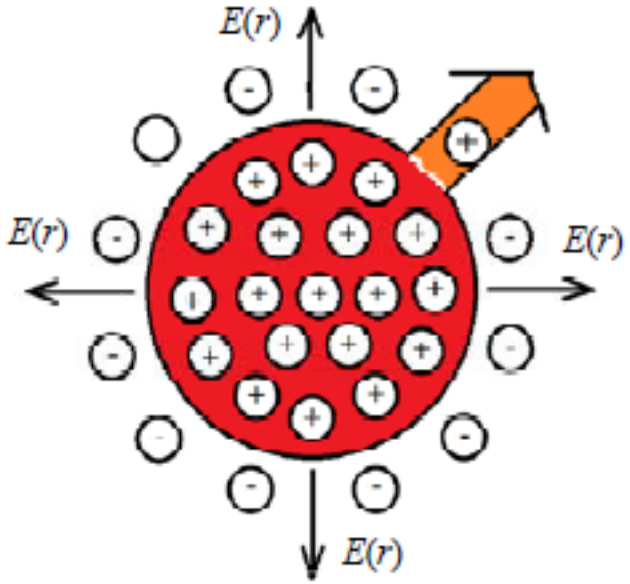








3D модель любого плазмоида, как супраатома или гигантского положительно заряженного иона



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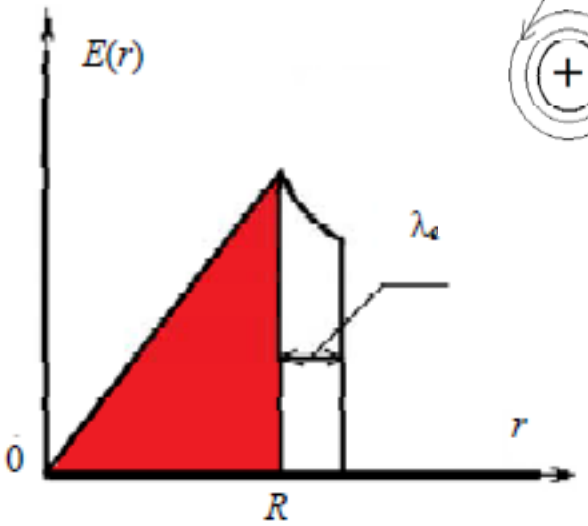

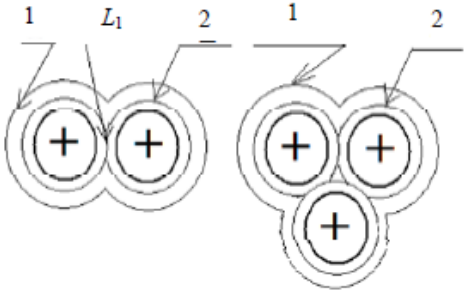

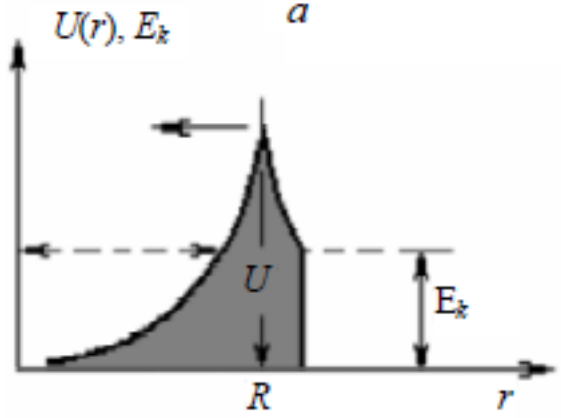

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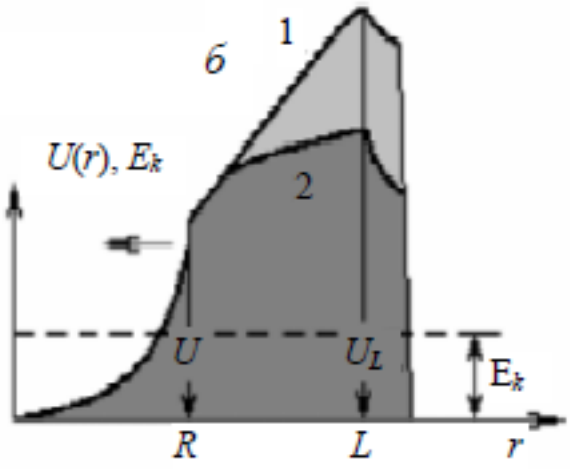

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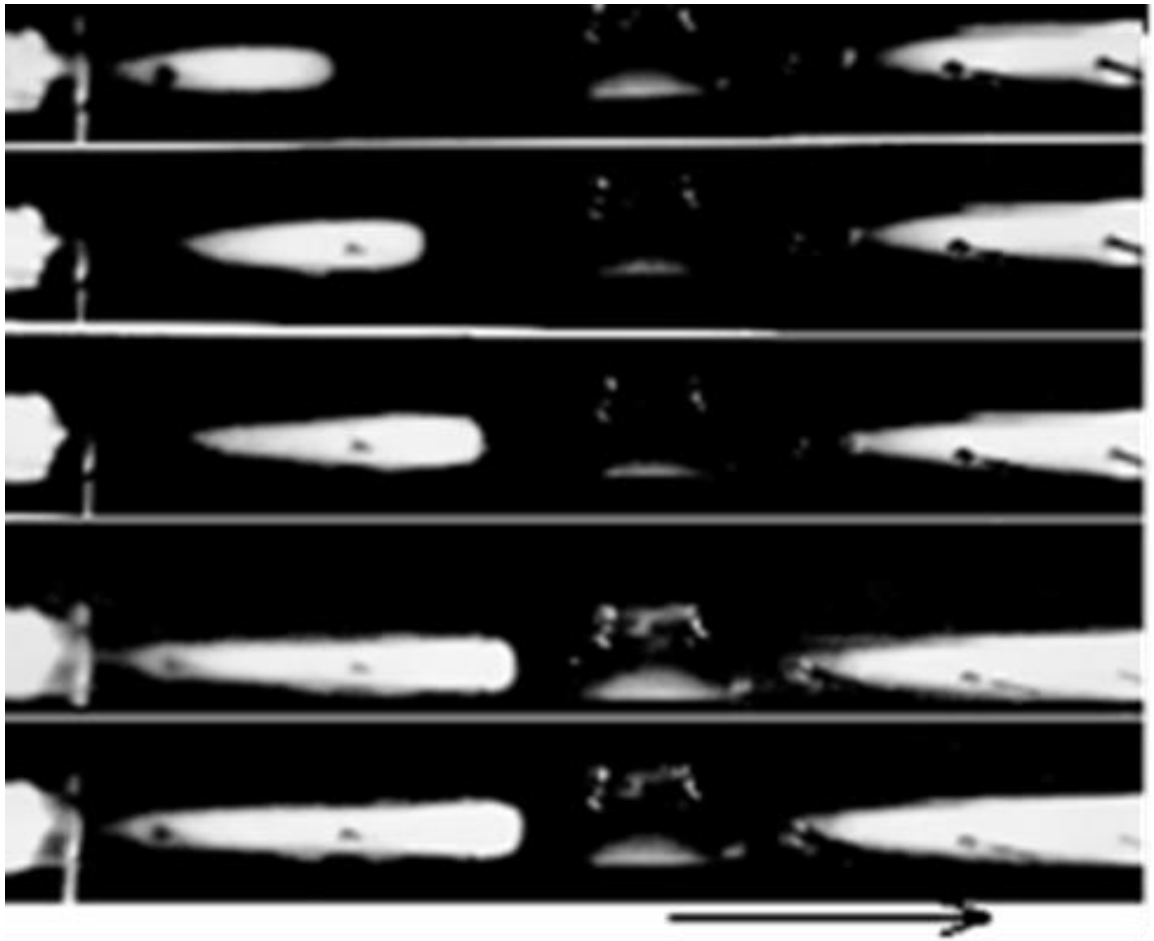
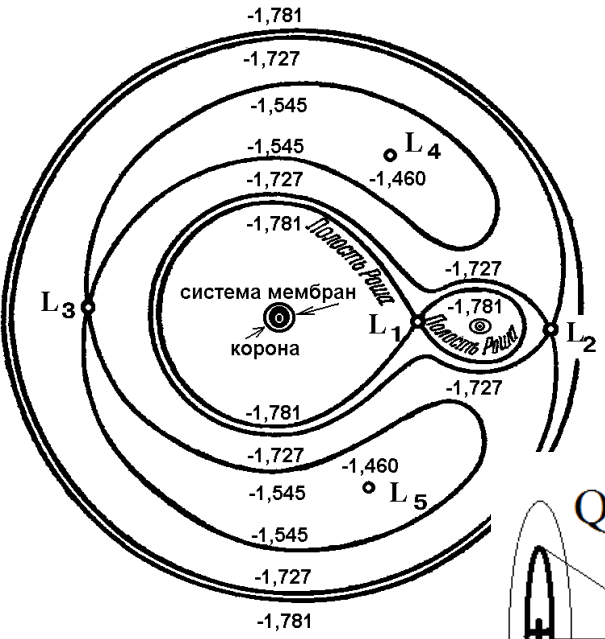
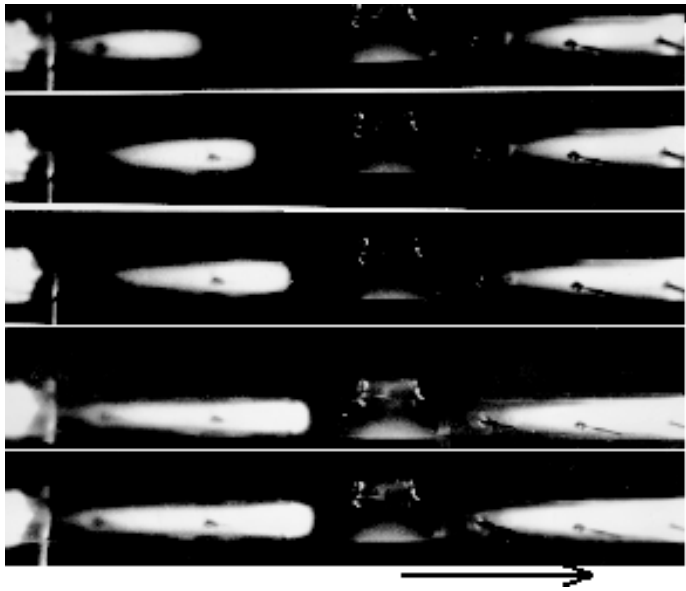
Стоячая ударная волна

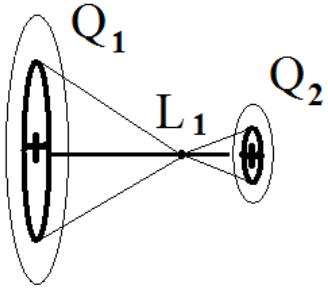
приведенного к плотности частиц электрического поля в газовом разряде

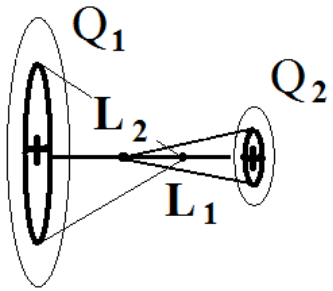


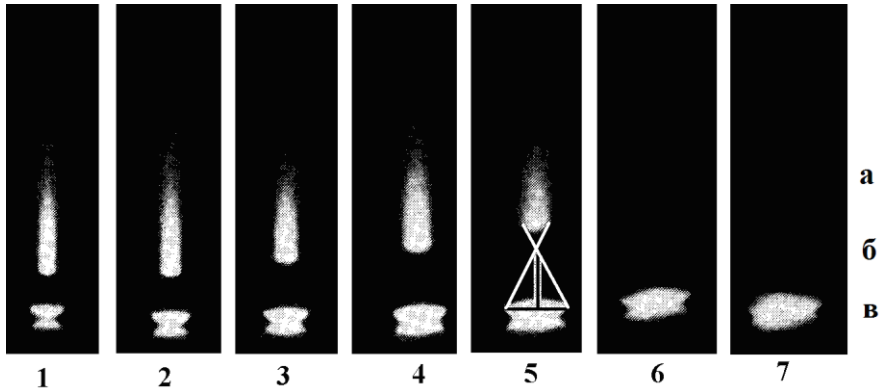
Демонстрация и обсуждение аналогов

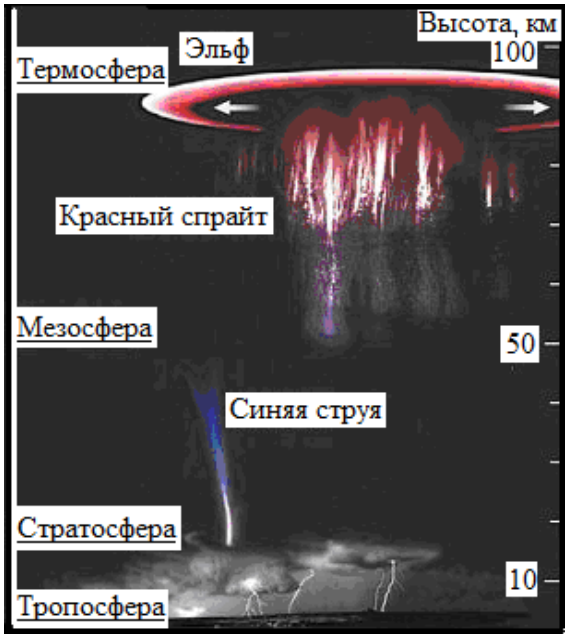












Спасибо за внимание

Вопросы

Высикайло Филипп Иванович