"Nanocomposites and nanomaterials"

The general dynamic properties of the conduction electron in the range a first Brillouin zone of graphene

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It was shown in [1] that the dispersion law for an electron (as a quasiparticle in the graphene conduction band) is rather complicated for constructing its generalized analytic dynamics. This is due to the fact that the components of the wave vector are mixed so that the dispersion law (which is also the quasiparticle Hamiltonian) cannot be "factored" into two summands containing only one component of the wave vector.

It was found that in the range of the first Brillouin zone of graphene there is a sufficiently large region: $|k_x| \le \pi/3a\sqrt{3}$; $|k_y| \le \pi/3a$, that allows one to construct such a dispersion law (effective). Based on this, the corresponding working energy range of electron injection was estimated for graphene: $E \le 5\,\text{eV}$. This range completely "covers" the entire range used in applications for graphene, and the estimation itself became possible due to the obtained generalized Louis de Broglie relation between the components of wave and mechanical pulses. In this case, the velocity and the effective mass of the injected electron were determined for definition the components of the mechanical pulse. Also we found a Lagrangian for an electron, as a quasiparticle, with relative to its wave description. Such a Lagrangian, as was shown earlier [2], is a summand in the phase of the wave function of an electron in the quantum description of it.

1. *Suprun A. D., Shmeleva L V.* Features of the Generalized Dynamics of Quasiparticles in Graphene // Nanoscale Research Letters. - 2017. - **12.** P. 187. http://dx.doi.org/10.1186/s11671-017-1940-0.
2. *Suprun A.D., Shmeleva L.V.* Features of generalized dynamics of quasiparticles in the presence of an external potential field. Part 1. General analysis of the problem // Functional Materials. - 2015. - **22,** № 4. P. 524. http://dx.doi.org/10.15407/fm22.04.524.