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Graphene quantum dots: structures, properties, electronic and optic applications

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This report is review of experimental data of formation graphane, oxide and fluoride graphene nanostructures with graphene nanopeaces, their electronic and optics properties, and computer modeling of of main similar nanostructures prepared by special ways. We consider next main structures and methods of their preparations: 1) H (or F) covered graphene and begrapnene nanostructures; 2) semiconductor superlattices of periodically changed graphane/or fluoride graphene and graphene paths (or graphane peaces divided semiconductor grapnene peaces); 3) arrays of individual GQDs on graphane matrix, and GQDs formed on graphene nanoribbons. We consider also modeling of forming process of GQDs from C60 transforming discovered recently in 2011 experiments. Modeling of mechanisms of formation, electronic and optic properties of considered structures will be discussed.

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Electrical and magnetotransport in vertically oriented magnetically functionalized carbon nanotubes arrays

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Due to the possibility to utilize the unique physical properties like ballistic electrical transport, Luttinger liquid behavior, high thermal conductance and etc., carbon nanotubes (CNT) still attract much attention from the scientific community. On another hand the use of transition metals (Fe, Co, Ni) as the catalyst for CNT growth opens the perspective to synthesize materials where manifest both exclusive CNT properties and nanomagnetic phenomena. In this work we report studies on the electrical and magneto- transport in vertically oriented magnetically functionalized carbon nanotubes arrays. The arrays were synthesized by pyrolysis of ferrocene /xylene solution. For all samples studied in our work the conductance is increasing with temperature rising in whole temperature range (LHe - room temperature). The magnetotransport measurements performed in the magnetic field range -8 ... 8 T show negative magnetoresistance. The absolute value of magnetoresistance is increasing with temperature rising. The nature of negative magnetoresitance is explained in terms of weak localization. The contribution of iron nanoparticlas into the arrays transport properties is also discussed.

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