Nanotructures based on H-(or F-) atom functionalized graphene elements for electronic and optic nano engineering

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This report is review of experimental data and modeling (based on author papers) of main graphene nanostructures coved H (or F) prepared by special ways.

It is known hydrogenation (as well as fluorization) of graphene changes ith electronic properties due to changing of sp2 hybridization of C-atoms to sp3 one. Presence of the C-H regions can open the dielectric gap and organizes semimetal-like (M) or semiconductor (S) electronic waveguide paths (graphene nanopaths - GNPs) on this graphene sheet [1,2] and also organize graphene quantum dots (GQD) on graphane (or diamane - diamond-like nano thin films and nanribbons) matrix [3,4]. We consider next main structures: 1) semiconductor superlattices of periodically changed graphane and graphene paths (or graphane piaces divided semimetal-like and semiconductor GNP); 2) arrays of individual graphene quantum dots (GQDs) on graphane matrix, and GQDs formed on graphene nanoribbons - GNRs; 3) modeling of mechanisms of formation of considered structures.

The electronic and mechanic properties of proposed structures studied by using *ab initio* (DFT) and molecular dynamics methods and compared them with the same properties of graphene-graphane (or graphene fluoride) structures. Possible ways of fabrication of nanoelectronic and nanooptics elements have been discussed.

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