# Production and characterization of nano-carbon structures

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Nano-carbon structures of various types attract great attention due to their unique properties allowing innovative applications in electronics and electrochemistry, optics and photonics, MEMS and NEMS etc.

We report here results on development of methods for fabrication thin film materials composed of nano-structured carbons of different types including single- and few-layers graphene, mesoporous nanographite (or carbon nanowalls), carbon nanotube forest and carbon nanoscrolls, nano- and micro-crystalline diamond films and individual diamond crystallites with unique geometrical shape of rectangular pyramids or platelets etc. The basic principle for production of all these materials and structures consist in condensation of carbon from gaseous phase of hydrogen/methane mixture activated by a direct current discharge. The deposition process has been investigated with use in-situ methodology based on optical emission spectroscopy of the discharge plasma as well on ex-situ comparative analysis of grown materials and deposition process parameters.

Extensive analysis of produced nano-structured material has been made using Raman and optical microscopies, electron microscopy and diffraction, energy dispersive analysis and cathodoluminescence. Important conclusions have been made on basis of results obtained with use of termo-gravimetric analysis of the produced carbon films.

All together obtained experimental results allowed generation of empirical models explaining mechanisms of the carbon nanostructures formation and prediction of possible methods for growth parameters optimization to achieve desirable characteristics of the materials.