

Nanostructured Interfaces and Surfaces

The structural diagram of carbon-nitride films produced by reactive magnetron sputtering

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Carbon structures with the nitrogen addition – carbon-nitride CN_x ($x < 1$) films – have even more interesting and diverse properties than carbon films. A wide variety of structural modifications in depending on synthesis conditions explains the long list of potential applications of the carbon-nitride films. The novel technology of non-catalytic production of nanostructured carbon-nitride films [1] by magnetron sputtering of a graphite target have been proposed. The ranges of the external parameters that control formation of microstructure CN_x films were determined.

A series of carbon-nitride CN_x ($x < 1$) nanostructured samples has been synthesized by reactive magnetron sputtering of a graphite target in the argon and nitrogen atmosphere in the conditions of low-temperature magnetron plasma. Magnetron plasma parameters (power, cathode current, pressure, a concentration of the plasma components, substrate temperature, distance from the substrate to the cathode, and others) was varying. Scanning electron microscopy and optical spectroscopy were used for structure characterization of the obtained CN_x films. It gave a possibility to control the parameters of obtained nanocolumnar and fullerene-like structures in dependence on the substrate temperature and the concentration of nitrogen. The characteristic absorption bands were found by optical spectroscopy for the basic nanostructures of carbon-nitride CN_x films. The structural diagram for the CN_x films in depending on the substrate temperature and the concentration of nitrogen was built. It includes four allotropic CN_x structures (graphite-like, fullerene-like, diamond-like and nanocolumnar structure) and mixed areas.

1. Shalaev R.V., Ulyanov A.N., Prudnikov A.M Noncatalytic synthesis of carbon-nitride nanocolumns by dc magnetron sputtering// Phys. Status Solidi A.- 2010. -**207**, N 10.- P.2300-2302.