

OR1806

Plasma surface modification of diamond-like carbon films to graphene

Savcho Tinchev¹

¹Institute of Electronics, BAS, Sofia, Bulgaria

stinchev@ie.bas.bg

Graphene has been the subject of research in the recent years because of its unique electrical, optical and mechanical properties. Usually graphene is deposited by CVD on metal substrates. For application in electronics, however, graphene films on insulating substrates are needed. Plasma surface modification was proposed [1] to create graphene on the top of the insulated diamond-like carbon (DLC) films. In such low-temperature process the surface of the amorphous carbon could crystallize to graphene as a result of point defect creation and enhanced diffusion caused by the ion bombardment.

Different types of ions were analyzed as possible candidates for plasma modification of amorphous carbon films. The first two are carbon and hydrogen ions, which are inherent to our a-C:H films and we do not expect to introduce chemical effects. The last one is argon ions, which are widely used in the microelectronic technology and as a noble gas should not react with the carbon.

In the experiment the DLC films were modified in DC magnetron system at unipolar pulsed discharges. After the modification the resistivity of the sample surface drops and the underlying DLC remained highly insulating. Raman spectra of the samples measured at 633 nm showed partial crystallization and were similar to the spectra of defected graphene. This result is very encouraging and we hope that by improving this technology it will be possible to fabricate defect-free graphene, which can be used in electronics without transfer to other substrates.

[1] S.S. Tinchev, Surface modification of diamond-like carbon films to graphene under low energy ion beam irradiation, Applied Surface Science 258 (2012) 2931–2934.

Keywords

Graphene
DLC
modification