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Plasma grown Graphene Nano Platelet mono films as enhanced surface for medical implant material and its electrode behavior

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Graphene Nano Platelets (GNP) films can contribute to enhance surfaces of bioactive materials and can be considered as non-cytotoxic and hemocompatible. They do not reduce cell viability (mouse fibroblasts) and do not cause a ß-thromboglobulin release above physiological level. Thinkable bio applications are also micro sized electrodes with extended inner surface for nerve stimulation.
In this work we consider the temperature and bias tension dependence a GNP film deposition process in a RF-PECVD chamber. The films were deposited at relevant test substrates like Ti, TiAlV, 316L and Si [100] for reference. The plasma process was performed using a high temperature and low pressure CO/H plasma. A negative self-bias tension was applied to the substrate.
The films have mean thicknesses between 50 nm to 300 nm. Their morphology investigated by SEM, STEM and TEM shows different forms. They are lateral isotropic upright standing GNP of about 10 nm to 25 nm thickness, flat graphene platelets, GNP with waved form and longer extension and lastly in the beginning of growth small rounded structures, forming to platelets later. This way a scalable void volume between the GNP and lateral density can be influenced by the plasma process. The range scales from 10 nm to about 100 nm. They all show graphitic electron diffraction pattern (SAED) measured by TEM.
Electric properties of GNP coated electrode materials have been investigated by Cyclic Voltammetry (CV) and Electrical Impedance Spectroscopy in Ringer's solution. Depending of the GNP size and lateral density interesting properties for applications as electrodes with nano scaled biocompatible surface occurred.

Keywords
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