Keep-in-Touch meeting
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Plasma-enabled synthesis of graphene-based materials for different applications

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Graphene and graphene-based materials are of great interest for numerous applications due to their exceptional properties. Common synthesis methods of these materials, however, are lengthy and complex chemical processes which require use of toxic agents and very often lead to low quality materials. Alternatively, a plasma-based method for synthesis of advanced 2D nanostructures is an environmentally friendly technique (without use of catalysts, acids etc.), which allows control over the synthesis process.

Free-standing graphene structures produced in Plasma Engineering Laboratory of N-PRiME/IPFN by microwave plasma method at atmospheric pressure conditions have been studied as potentially low secondary electron emission (SEE) materials. Chemically inert graphene coatings obtained by electrophoretic deposition were prepared in collaboration with CEFITEC, Universidade Nova de Lisboa. Additionally, the ability to change the SEE properties of graphene by doping with nitrogen was demonstrated.

Plasma-enabled synthesis of vertically oriented graphene structures and their prospects as electrodes in high frequency AC filtering capacitors were also investigated. A slot antenna microwave plasma at low pressure was used for growth and for post-synthesis nitrogen doping. Pure and doped vertical graphene structures grown directly on Ni-foil current collector demonstrated excellent electrochemical performance, characterized by high capacitance (480 μF at 100 Hz), low equivalent series resistance, and appropriate phase angle.