**Plasma-assisted nitrogen doping of Langmuir-Blodgett self-assembled graphene films**

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Application of highly transparent films obtained by self-organization of graphene flakes in optoelectronic devices seeks for appropriate surface modification/functionalization, which will adapt their electrical properties to the requirements of the electronic industry. Doping with nitrogen is one of the most promising methods to tailor the electronic properties of graphene [1]. Graphene films prepared from solution and deposited by Langmuir-Blodgett self-assembly (LBSA) [2, 3], were treated with radio-frequency (13.56 MHz) nitrogen plasma in order to investigate the influence of the time of nitrogen plasma exposure on the work function, sheet resistance and surface morphology of LBSA graphene films. Plasma treatments were performed in a chamber with plane-parallel electrode geometry with 5cm electrode gap and at 500 mTorr of N2. Tuning parameter in this work was treatment duration. Kelvin probe force microscopy (KPFM) and sheet resistance measurements confirm nitrogen functionalization of our films, with the Fermi level shifting in the direction that indicates binding to a pyridinic and/or pyrrolic site [4], as would be expected for LBSA graphene, where edges are the dominant defect type [5]. We show that by tuning exposure time, we can decrease sheet resistance by a factor of two, without affecting surface morphology. Upon 1 min of nitrogen plasma exposure, the sheet resistance decreases and there is no obvious difference in film morphology. However, plasma exposure longer than 5 min leads to removal of graphene flakes and degradation of graphene films, in turn affecting the flake connectivity and increasing film resistance. Controllability of the plasma technique has an advantage for graphene functionalization over conventional doping techniques such as chemical drop-casting. It allows to controllably tune the work function, surface morphology and sheet resistance of LBSA films, which is substantial for applications in various optoelectronic and electronic devices.

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