

**2016 E-MRS Lille May 2–6
Symposium Y**

**Direct Synthesis of Nitrogen Doped Graphene by Ultrashort Pulsed Laser
Deposition**

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Abstract

Graphene and doped graphene materials new synthesis routes are an attractive prospective. Especially, nitrogen doping has been an effective way to tailor the properties of graphene and make them attractive in a wide range of potential applications [1]. Recently, pulsed laser deposition of graphene has been shown to be effective in electrochemistry and biosensors applications [2]. This work reports graphene and N-doped graphene synthesis by femtosecond pulsed laser deposition. The nitrogen doping and structural changes have been studied systematically by various characterization techniques. The X-ray photoelectron spectroscopy has been performed to elucidate the C-N bonding information and N content in doped graphene. Doping of graphene decreased the 2D peak intensity compared to the pure graphene, and Raman mapping confirmed that the doping is homogeneous. The crystalline size (La) of N-doped graphene decreased with doping. The N atoms are evidenced by XPS to mainly pyridinic-N type nitrogen structure, with a N doping content up to 3 at.%. The surface morphology of films was studied by Scanning electron microscopy and Atomic force microscopy. This simple, fast and low temperature approach offers directly pyridinic-type of N bonding with high N content. This type of grown N-doped graphene could be a promising material in electrochemical sensors, electrochemical energy devices, bioelectronics and biosensors applications.

References

1. Wang, H., Maiyalagan, T. & Wang, X. Review on Recent Progress in Nitrogen-Doped Graphene: Synthesis, Characterization, and Its Potential Applications. *ACS Catal.* **2**, 781–794 (2012).
2. P. Fortgang *et al.* Robust electrografting on self-organized 3D graphene electrodes. *ACS Appl. Mater. Interfaces* (2015). doi:10.1021/acsami.5b10647