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Synthesis of N-graphene using microwave plasma-based methods¹ ANA DIAS, ELENA TATAROVA, JULIO HENRIQUES, FRANCISCO DIAS, EDGAR FELIZARDO, Instituto de Plasmas e Fusao Nuclear, Instituto Superior Tecnico, Universidade de Lisboa, Portugal, MIROSLAV ABRASHEV, Faculty of Physics, Sofia University, Bulgaria, NENAD BUNDALESKI, University of Belgrade, Serbia, UROS CVELBAR, Jozef Stefan Institute, Slovenia — In this work a microwave atmospheric plasma driven by surface waves is used to produce freestanding graphene sheets (FSG). Carbonaceous precursors are injected into a microwave plasma environment, where decomposition processes take place. The transport of plasma generated gas-phase carbon atoms and molecules into colder zones of plasma reactor results in carbon nuclei formation. The main part of the solid carbon is gradually carried from the "hot" plasma zone into the outlet plasma stream where carbon nanostructures assemble and grow. Subsequently, the graphene sheets have been N-doped using a N2-Ar large-scale remote plasma treatment, which consists on placing the FSG on a substrate in a remote zone of the N2-Ar plasma. The samples were treated with different compositions of N2-Ar gas mixtures, while maintaining 1 mbar pressure in the chamber and a power applied of 600 W. The N-doped graphene sheets were characterized by scanning and by high-resolution transmission electron microscopy, X-ray photoelectron spectroscopy and Raman spectroscopy. Plasma characterization was also performed by optical emission spectroscopy.

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