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Microwave plasma based method for free standing graphene synthesis ELENA TATAROVA, JULIO HENRIQUES, Institute of Plasmas and Nuclear Fusion, Instituto Superior Tecnico, Technical University of Lisbon, Portugal, CLAUDIA LUHRS, JONATHAN PHILLIPS, Department of Mechanical and Aerospace Engineering, Naval Postgraduate School, Monterey, CA 93943, USA, ANA REGO, ANA FERRARIA, Centro de Quimica-Fisica Molecular and IN, Instituto Superior Tecnico, Technical University of Lisbon, Portugal, MIROSLAV ABRASHEV, Faculty of Physics, Sofia University, Sofia, Bulgaria, ANA DIAS, CARLOS FERREIRA, Institute of Plasmas and Nuclear Fusion, Instituto Superior Tecnico, Technical University of Lisbon, Portugal — Microwave atmospheric pressure plasmas driven by surface waves were used to synthesize graphene sheets from vaporized ethanol molecules carried through argon plasma. In the plasma ethanol decomposes creating carbon atoms that form nanostructures in the outlet gas stream. The synthesized carbon nanostructures were analysed using high-resolution transmission electron microscopy (HRTEM), X-ray photoelectron spectroscopy (XPS), and micro-Raman spectroscopy. The existence of few layer graphene (from one to five sheets) has been confirmed by HRTEM images. Raman spectral studies were conducted to determine the ratio of the 2D to G peaks. Furthermore, the C 1s XPS region is dominated by the peak centred at 284.4 eV assigned to sp^2 carbon atoms bond to carbon. Forced external heating of the outlet gas stream results in an increase of the sp^2/sp^3 (> 4) and C/O (> 14) ratios. Analysis of the C 1s XPS energy loss spectra reveals plasmon energy losses attributed to π-π^* collective excitation.

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