Supplementary Information

Direct Synthesis of Graphene on Silicon Oxide by low temperature Plasma Enhanced Chemical Vapor Deposition

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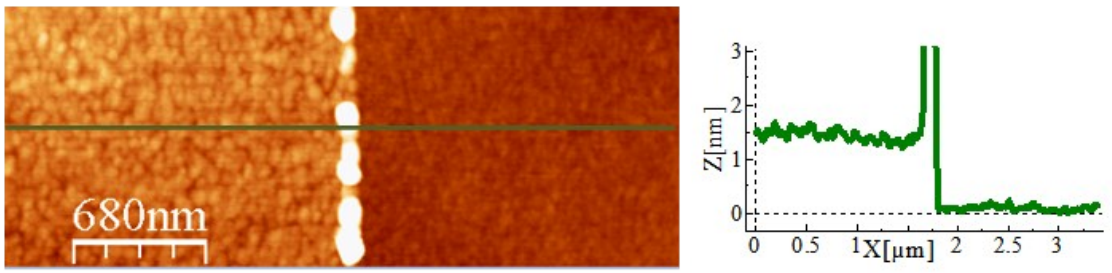

Figure S1. AFM image of the graphene nuclei at 600ºC and corresponding profile after sweeping away the deposited material, P_T = 5.4×10^{-2} mbar, P = 200 W, t_1= 5 min t_2= 150 min. H_2/C_2H_2 50/0.9:0.8 (sccm). The rms value on the right side of the image is 0.18 nm, similar to pristine wafer

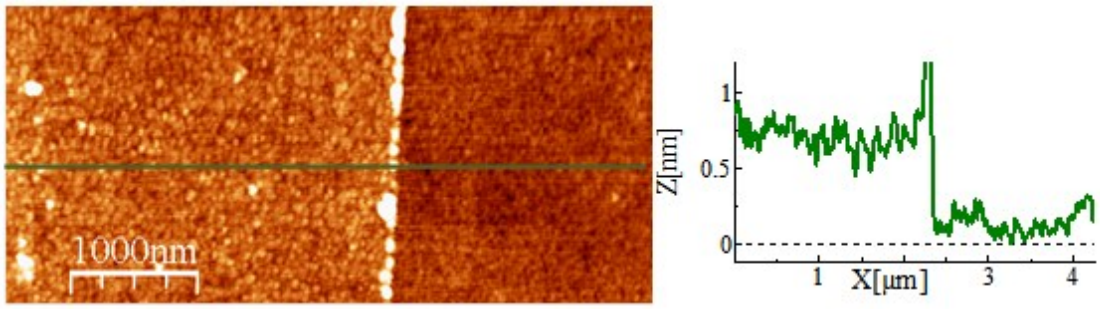

Figure S2. AFM image of the graphene nuclei at 600ºC and corresponding profile after sweeping away the deposited material, P_T = 5.4×10^{-2} mbar, P = 200 W, t_1= 5 min t_2= 150 min. H_2/C_2H_2 50/0.6:0.5 (sccm). The rms value on the right side of the image is 0.19 nm, similar to pristine wafer.

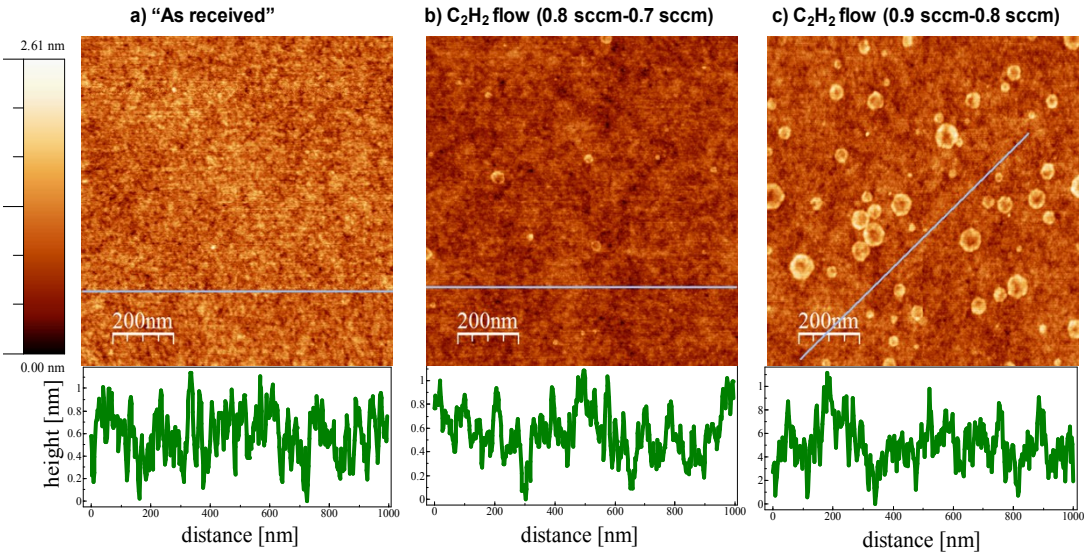

Figure S3. a) AFM topography image and roughness profile of the substrate as received, before depostion. b) and c) AFM images of the graphene nuclei and corresponding roughness profiles at 550ºC, P_T = 5.4×10^{-2} mbar, P = 200 W, H_2=50 sccm, t_1= 5 min t_2= 150 min. a) C_2H_2 flow: 0.8 sccm in the nucleation and 0.7 sccm in the growth step. b) C_2H_2 flow: 0.9 sccm in the nucleation and 0.8 sccm in the growth step.

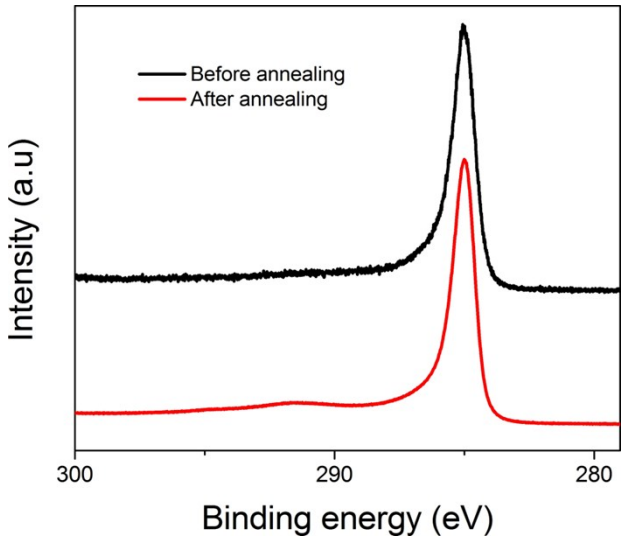

Figure S4. XPS C1s analysis of the sample deposited at 550ºC before and after annealing at 580ºC. The shape of the peak, especially after annealing, resembles the HOPG spectrum.

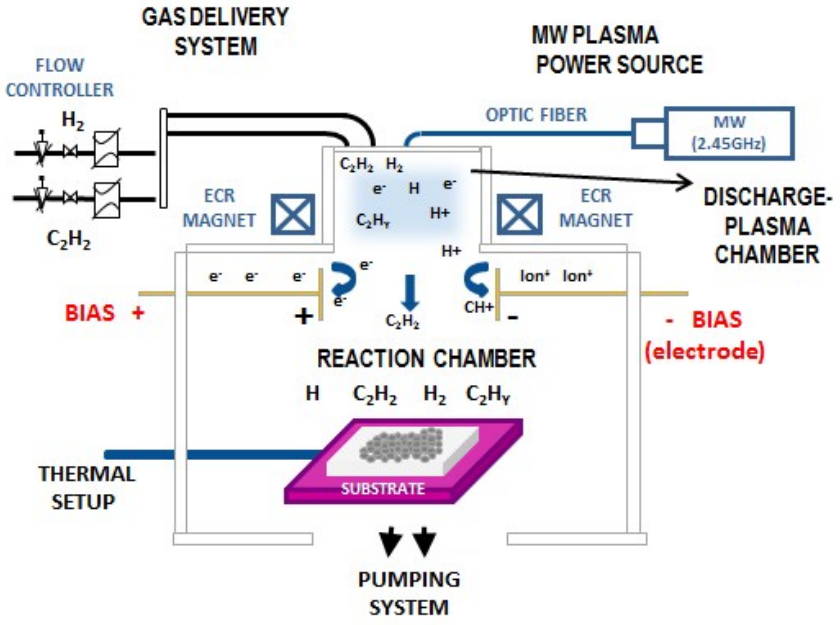

Figure S5. Schematic diagram of the ECR-CVD system. The system consists of two connected chambers, the discharge chamber, where the plasma is activated, in the upper side and the reaction chamber at the bottom. The plasma chamber is surrounded by the following instrumentation: a gas delivery system with gas flow controllers (hydrogen and acetylene in our case introduced directly into the plasma chamber), a microwave plasma power source with and optic fiber coupling the power to the plasma chamber and the electron cyclotron resonance magnet surrounding its perimeter. The activated species are transported by a vertical turbulent flow from one chamber to the other. The flow direction is perpendicular to the sample surface. The reaction chamber includes two electrodes attracting electrons and ions, as only neutral species reach the sample substrate and a thermal setup heating the substrate holder. Finally, the system is completed with a two stage pumping system at the bottom of the chamber.

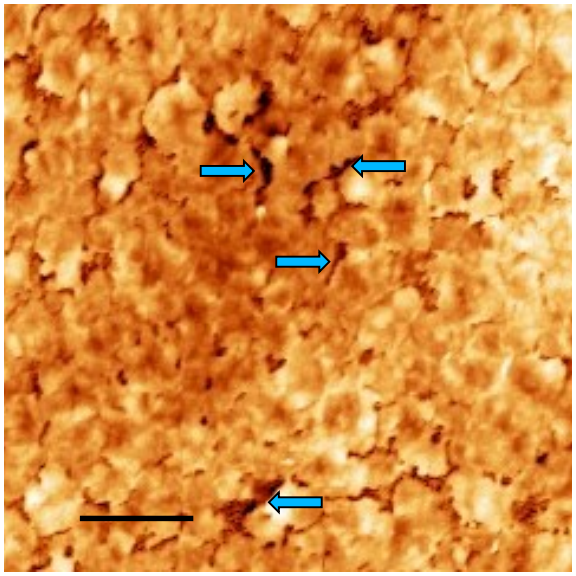

Figure S6. AFM topographic image of graphene continuous film at 550 ºC, H_2/C_2H_2 = 50/0.9:0.8 (sccm), $P_T = 5.4\times10^{-2}$ mbar: P = 200 W, $t_1 = 5$ min $t_2 = 10$ h. Vertical scale: 0-5 nm. Line scale: 200 nm. the lack of continuity in some points is clearly observed (see i.e. the point indicted by blue arrows).