Direct Growth of Graphene on Transparent Insulators: Quartz & Silica

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A new method for the direct growth of graphene films on dielectric substrates is reported, using remote electron cyclotron resonance plasma assisted chemical vapor deposition r-(ECR-CVD) at low temperature (700ºC). We have devised a two step deposition process- nucleation and growth- by changing the process conditions at constant temperature. Up to 500 nm grain sizes are attained for mostly monolayer continuous films exhibiting transmittance larger than 92% and sheet resistance lower to 900 Ω, after low temperature annealing. The grain size and nucleation density of the resulting graphene sheets can be controlled varying the deposition time and pressure. A shelf-limiting character of the process can be conjectured when coalescence of rotational aligned graphene domains takes place and stitching occurs. This method is easily scalable and avoids damaging and expensive transfer steps of graphene films, improving compatibility with current fabrication technologies.

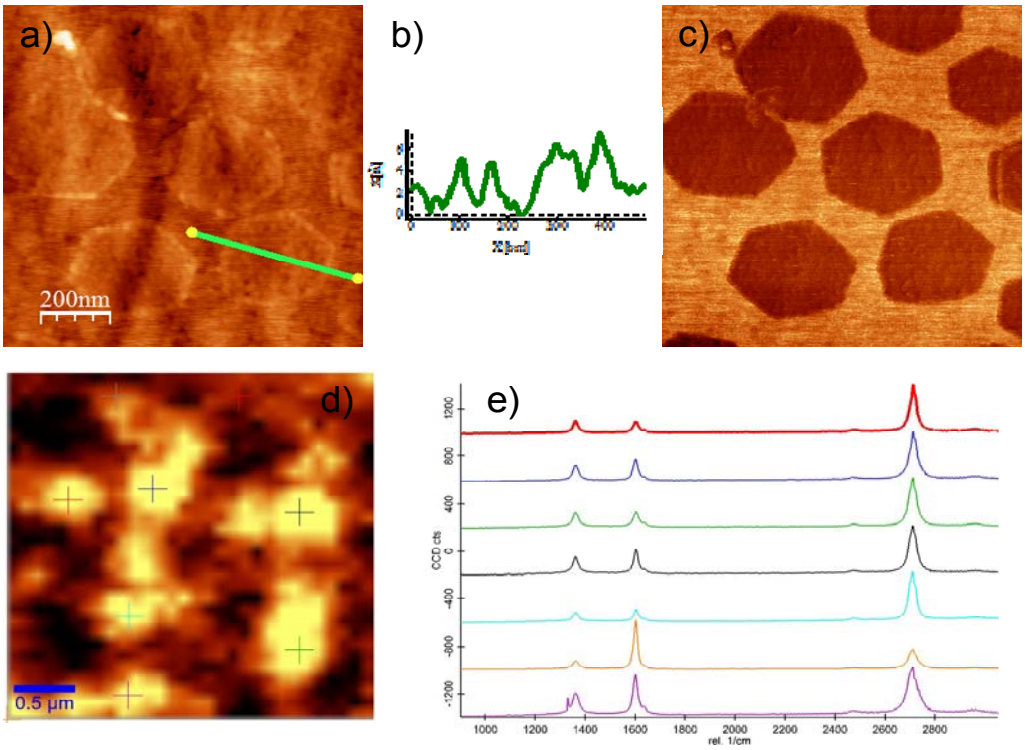

Figure 1. a) AFM image of the deposit in quartz. b) line profile of monolayer flakes. C) Friction force image of monolayer flakes. D) Raman map of the 2D peak. E) Typical Raman spectra on many points show mostly monolayer grains.

References

[1] Spanish Patent Application: "Deposition of graphene layers by electron cyclotron resonance plasma-assisted chemical vapour deposition" Reference ES1641.1084, R. Muñoz, Cristina Gomez- Aleixandre y M. Garcia Hernandez, 2015.