Direct synthesis and characterization of graphene layers on silicon dioxide substrates

A. N. Barbosa
C. D. Mendoza, M. E. H. Maia da Costa, F. L. Freire Jr.
PUC-Rio, Rua Marquês de São Vicente 225, Gávea, Rio de Janeiro, Brazil.

andrenbarbosa@vdg.fis.puc-rio.br

Direct synthesis of graphene on semiconductors and dielectric substrates is of high interest as this process bypasses typical transfer procedures, which usually uses polymers as sacrifice layers along with toxic chemicals and it leaves out residues that often damages the graphene flakes as well. The interest of direct graphene synthesis comes as high yield, electronic grade graphene is only possible by eliminating the transfer process and tuning the growth process to maximize graphene quality. We worked on the direct synthesis of graphene layers on silica glass and silicon dioxide wafers substrates by chemical vapor deposition at semi-atmospheric pressure environment inside the tube reactor, using controlled mixtures of hydrogen, argon and methane gases. The effects of the methane flux and the total pressure on the homogeneity of the graphene layers were investigated. The samples were characterized using Raman scattering spectroscopy and Raman mapping, Atomic force microscopy, X-ray photoelectron spectroscopy and optical transmittance measurements and sheet resistivity measurements. Large area, homogeneous bilayer graphene was obtained for an appropriate gas mixture and Raman spectroscopy results indicate that misoriented graphene bilayers were obtained.

References

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Figures

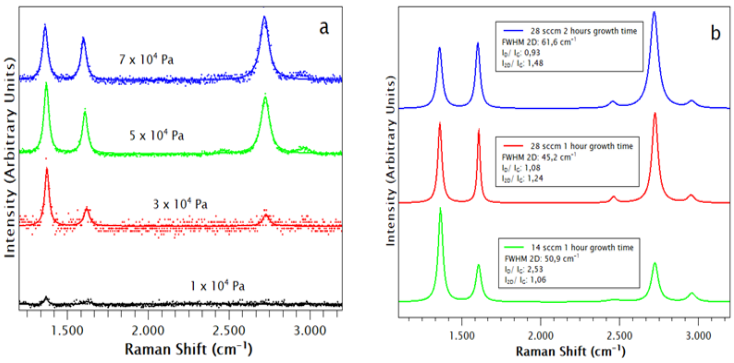

Figure 1: Raman Spectra of graphene at (a) different growth pressures and (b) different growth time and CH_4 fluxes.

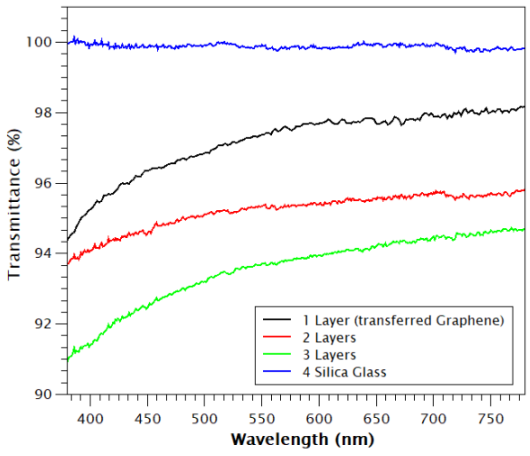

Figure 2: Transmittance spectra of graphene layers in fused silica glass.