Morphological and electrical characterizations of graphene exfoliated by liquid way

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Graphene is a relatively new material with very high potential for technological innovation through its electrical, mechanical and thermal exceptional properties.

The liquid exfoliation methods of graphene sheets has been known for some years; the characteristics of the obtained suspensions strongly depend on the experimental parameters. These parameters govern, the number of sheets in solution, their thicknesses and dimensions and their structural and electrical properties when deposited on a substrate.

In this work we show the influence of the liquid phase exfoliation conditions such as solvent choice, sonication duration and temperature

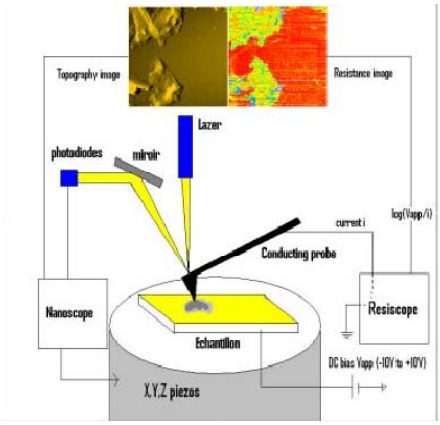


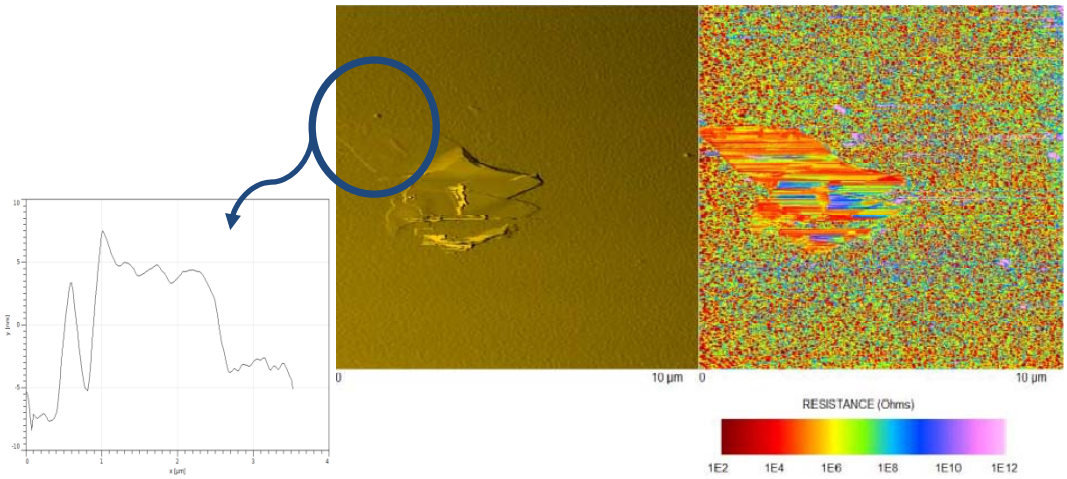
Figure 1: Schematic topography on a local resistance measurements, with a CP-AFM (module "Resiscope")

By changing the solvent allowing the deposition of and by performing the exfoliation at its boiling temperature we have been able to obtain suspensions to deposit graphene like sheets of interesting properties on various type of substrates(Au, Si, dopped Si). CP-AFM (Resiscope module developed at LGEP) and confocal micro-Raman techniques were used to study: the morphology, electrical and structural properties of sheets.

Graphene like sheets with very few defects (as measured by the ratio of the intensity D peak over G peak) and good conductance (as measured with PtIr CP-AFM) were observed.

First attempts to characterize even covering films from the overlapping of these sheet have been made by performing electrical measurements with a "Van Der Pauw" like technique and show sheet resistance values as low as 85Ω/sqr.

Further work involves optimization of the deposition technique in order to elaborate low cost graphene like film for a large rangs of applications.



Figures 2: CP-AFM of a "graphene like" sheets deposited on a gold surface with a PtIr tip with an applied force 70nN

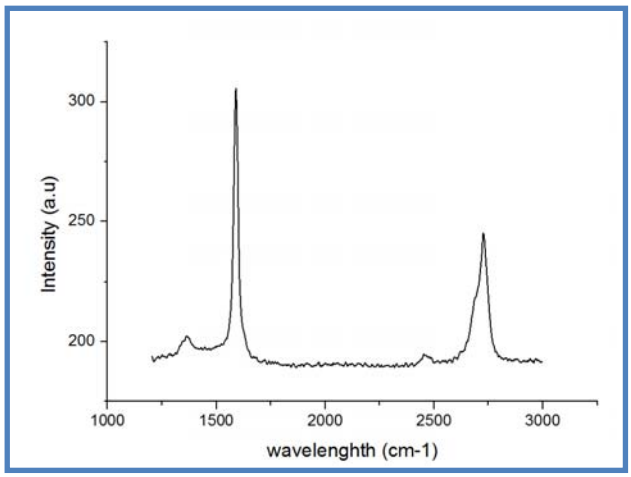


Figure 3: Raman spectra of the above "graphene like sheet" (532nm laser source)