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Direct growth of graphene on insulators and semiconductors by plasma assisted chemical vapor deposition: a route towards industrial applications

Direct growth of graphene films on insulating or semiconducting substrates of technological interest has been an ambition for the past years, as transfer methodologies usually degrade the outstanding graphene properties or contaminate the interfacial contact between both materials. Among all the explored methods, plasma assisted chemical vapor deposition (PA-CVD) has been recently proposed as a valuable technology to direct and catalyst-free growth of graphene thin films on relevant substrates of industrial use [1]. In tune with this trend, recently we have devised new protocols to growth graphene films on top of diverse oxide substrates (silicon oxides, titanium oxide) at low temperature by using PA-CVD and now, we are extending its application to transition metal dichalcogenides (MoS_2) [2,3]. These materials have important applications in several fields, improving their performance and operation range in combination with graphene related materials [4,5].

In this contribution, we present our synthesis approach and recent experimental results. The fabricated graphene films are characterized in terms of morphology, chemical structure and composition, conductivity and light absorption properties in combination with the substrates. The observed properties of the films present interdependence with the substrate used. We also point out many examples of novel applications of this graphene coated substrates. The methodologies shown are intrinsically pure, easily scalable and avoid the transfer of the films. The results presented here represent a step forward in graphene integration for a variety of applications.

References

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Figures

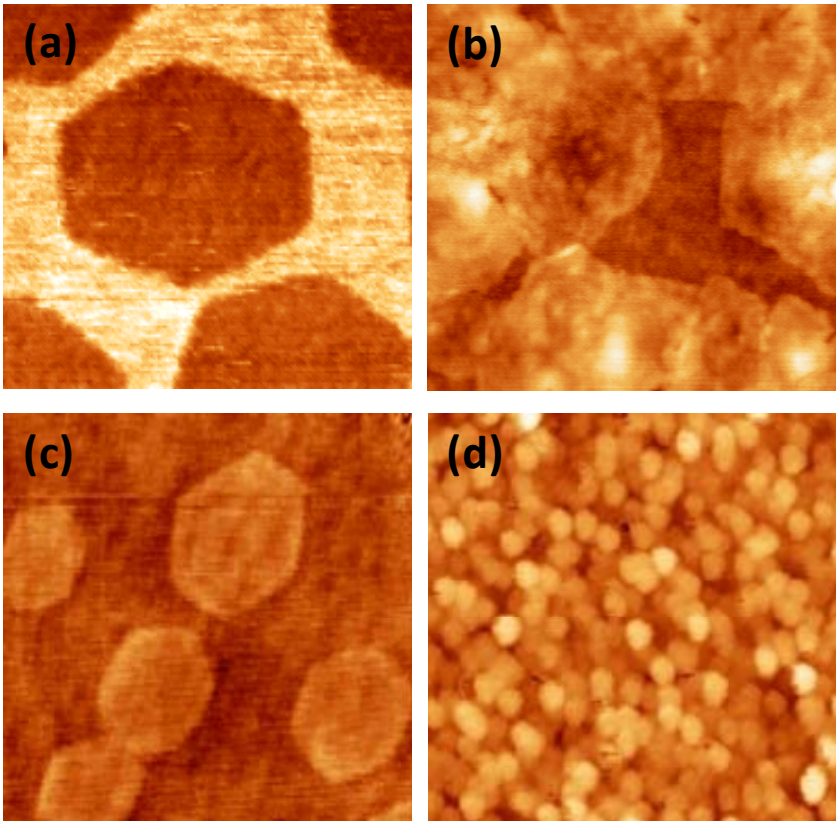

Figure 1: AFM images of graphene crystals (submonolayer coverage) and continuous films structures grown on a variety of substrates. (a) Quartz (b) Silicon wafer. (c) Fused silica. (d) TiO_2.