Departamento de Física de Materiales

Graphene-substrate interactions: its influence on CVD growth of graphene and its properties

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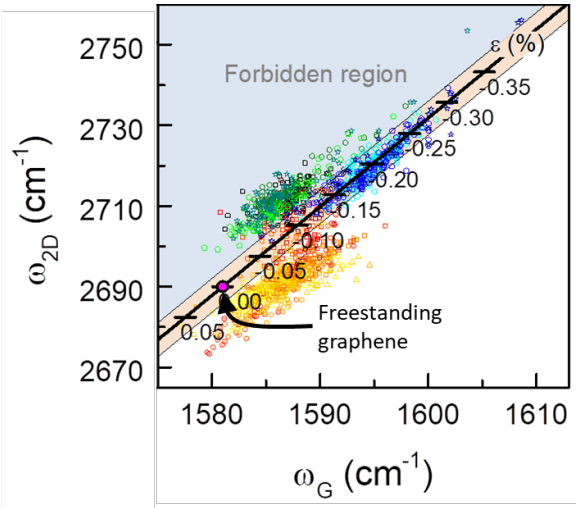
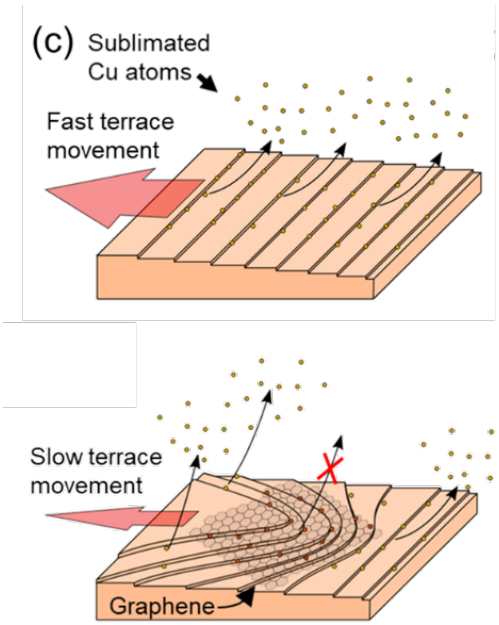
Graphene is the first two-dimensional material ever synthesized and its outstanding properties have made it one of the hottest research topics in materials science since the last decade. While there are currently several synthesis routes, the most widely used method for the large scale production of high quality graphene is still chemical vapor deposition (CVD) on different metallic substrates. In this talk I will show how the interaction between graphene and its supporting substrate strongly determines not only the CVD growth process of graphene itself, but the final properties of both the graphene layer and its underlying substrate. Among all the possible graphene-substrate combinations I will focus on two material systems with an especial importance for the industry. The first one, graphene on polycrystalline copper, currently offers the best trade-off between graphene quality and economic expense, and in this case I will show how the orientation of the different Cu grains plays a crucial role in the anticorrosion capabilities of graphene, and its influence on the surface restructuration of the Cu substrate [1,2]. Interestingly, the interaction of graphene with some Cu grains presenting particular crystalline orientations induces an anomalous shift in the Raman spectra that cannot be interpreted with the current knowledge of graphene Raman spectrum. For the second material system, I will focus on graphene grown on ruthenium thin films, which is one of the substrates that can yield very large areas of extremely high quality single layer graphene (SLG) [3]. In this case the interaction between graphene and the underlying Ru is mediated by the formation of a novel RuC phase, whose presence is critical for the growth of single or multilayer graphene [4].





[1] L. Álvarez-Fraga, *et al. Chem. Mater.* **29,** 3257 (2017).
[2] J. Bartolomé, *et al. 2D Mater.* **6,** 015023 (2019).
[3] Y. Pan, *et al. Adv. Mater.* **21**, 2777–2780 (2009).
[4] F. Jiménez-Villacorta, *et al. J. Mater. Chem. C* **5**, 10260—10269 (2017).