Strain field in graphene: a substrate study.

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Graphene membrane display unwanted ripples that limit electrical, thermal and mechanical properties (1). Nevertheless, by locally tune strain in graphene, we could influences its electronic, magnetic and vibrational properties (2,3). In this work on CVD graphène, we show that, in the vicinity of edges and wrinkles, graphene membrane present strain fields having magnitudes of several tenths of a percent and extending across typically micrometer distances (4). These wrinkles on graphène membrane are strongly dependant on the growth substrate even more than the transfer substrate.

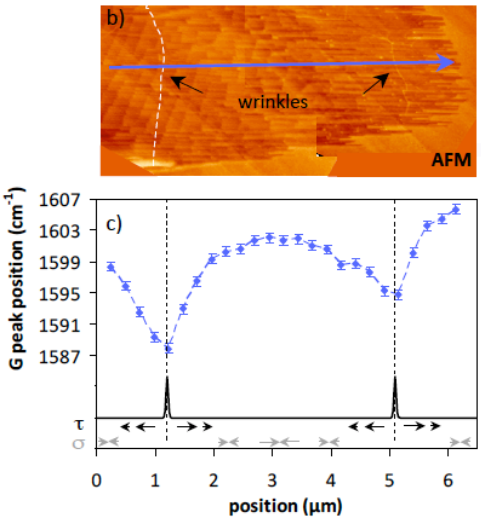

Figure 1: strain variations around a wrinkle

By combining microscopy techniques and spatially resolved optical phonons measurements, we reveal the nature of strain transfer between compressively strained graphene prepared by chemical vapor deposition (CVD) and a cobalt substrate. The geometry of the monolayer, the interfacial properties, and the presence of wrinkles lead to highly non uniform strain in the graphene, varying from uniaxial to biaxial.
A non-linear shear-lag model captures these strain fields in terms of the graphene-substrate interaction and provides an understanding of strain-relieving wrinkles in graphene for any level of graphene-substrate. These specific experimental results on graphene@cobalt will also be compared to different growth graphene on various substrates [5–7].

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