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**Thickness-dependent native strain in graphene membranes visualized by Raman spectroscopy** SUNMIN RYU, SUJIN KIM, Pohang Univ of Sci Tech — Since graphene has an extreme surface-to-volume ratio, its various material properties are known to be susceptible to interactions with environment. Its high stretchability, in particular, allows graphene to conform well to external perturbation, which leads to modifications of its electronic, magnetic and chemical properties. In this work, we report a Raman spectroscopic strain metrology and visualize the native strain induced by the van der Waals interactions of mechanically exfoliated graphene of varying thickness with supporting silica substrates. Using freestanding graphene as a strain-free and charge-neutral reference, we quantified the resulting strain with a resolution of 0.02% and found that its spread decreases as increasing the number of layers finally reaching the detection limit for the thickness of  $\sim 30$  layers. The spatially resolved strain maps revealed that the native strain is randomly distributed and that both of compression and expansion are also randomly generated. The current optical analysis can serve as a highly sensitive and efficient strain metrology tool for graphene samples in a wide range of thickness and can be extended to other 2-dimensional crystal systems.

Sunmin Ryu  
Pohang Univ of Sci  
Tech

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