**INVESTIGATING STRESS CONSENTRATION AROUND A CIRCULAR NOTCH IN MONOLAYER GRAPHENE/POLYMER MODEL COMPOSITE**

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**ABSTRACT**

Fracture performance is of pivotal implication when it comes to understanding the mechanical properties of any solid material. Crack propagation patterns may fluctuate significantly in the presence of various defect types, such as holes, wrinkles, fissures and lattice defects, as stress concentration is higher close to them[1,2]. Same holds true for graphene, the two dimensional sp2 hybridized carbon lattice, which is known for its excellent mechanical properties, exhibiting an ultrahigh intrinsic strength of 130 GPa and an elastic modulus of about 1 TPa[3]. To probe the fine features of stress profiles around defects, Raman spectroscopy has proven to be a powerful tool, consequent of its high sensitivity to detect any strain application (tensile/compressive) to graphene[4,5].

Herein, we investigate the stress distribution profile of CVD graphene in close proximity and far from self-inflicted defects, such as holes, with the application of tensile strain. Large size monolayer graphene is synthesized by Chemical Vapor Deposition (CVD) on copper foils and is subsequently transferred on top of PMMA substrates. Next, graphene is punched with a microdrill in order to induce the defective site of examination. The system is then studied, *in-situ*, under tensile strain while acquiring simultaneously Raman mappings in the vicinity and in the far field of the defective area for the sake of comparison. The results indicate that the stress magnitude near the hole is greater than in the non-defective area. These findings are in good agreement with those obtained via finite element analysis and thus is evident that they can pave the way for precise defect engineering of 2D materials.

**KEYWORDS:** Graphene, Fracture behavior, Stress distribution, Raman spectroscopy

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