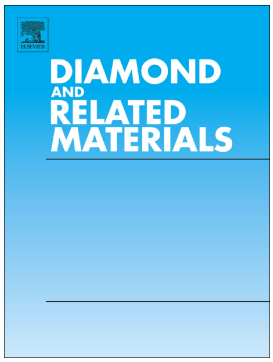

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Temperature and Pressure Dependent Raman Spectroscopy of Plasma Treated Multilayer Graphene Nanosheets

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Abstract:

Understanding of the fine structure at the atomic level and properties of graphene by creating defects is important from the point of view of thermal and stress management. Here we report Raman spectroscopic studies on pristine and plasma treated multilayer graphene to explore the remarkable structure and phonon properties with temperature and pressure. Temperature dependent studies illustrate monotonic softening of G and G′ bands in the temperature range 78 to 573 K. This process can be of fundamental importance in other promising and emerging nano and heterostructured materials. The pressure dependent Raman spectroscopic investigations on G-band of these samples were carried out up to 25 GPa using a diamond anvil cell. Comparatively weak and more compressible nature of the G band (E_{2g} in-plane mode) as a function of applied pressure is found in plasma treated graphene. After pressure release, the samples recover to their original ordered structure. The present study is important for further understanding of the fine structure, properties and effect of defects in graphene, which can affect the atomic bonds, thermal expansion, specific heat, and thermal conductivity as well.

Keywords: Graphene, Plasma treated graphene, Raman Spectroscopy, phonon, High pressure

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