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Supplementary Information

Direct assessment of the mechanical modulus of graphene co-doped with low concentrations of boron--nitrogen by a non-contact approach

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(a)

Graphene		
Strain of PDMS (%)	0.8	1.6
Actual strain applied on sample (%)	3.96×10^{-2}	7.92×10^{-2}

(b)

2BNG		
Strain of PDMS (%)	0.4	0.8
Actual strain applied on sample (%)	2.22×10^{-2}	4.44×10^{-2}

Table S1 Actual strain applied on (a) pristine graphene and (b) 2BNG.

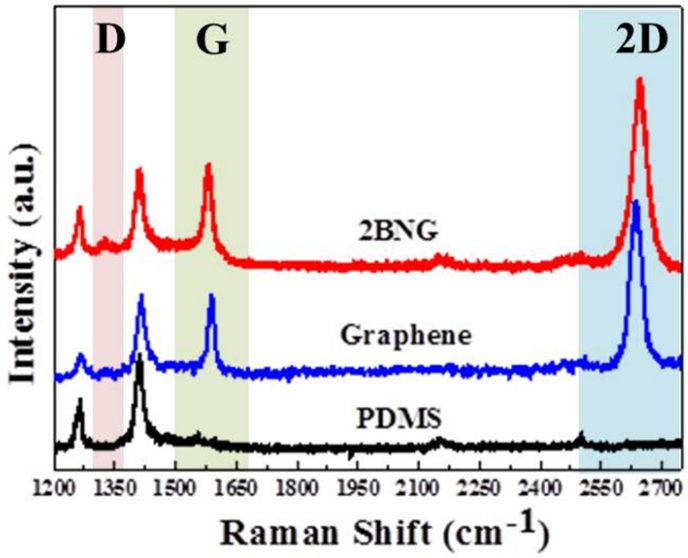

Figure S1. Raman spectrum of CVD graphene and 2BNG transferred onto PDMS substrates. We also provide the background signal for pure PDMS substrate. The main Raman peaks, the G and 2D peaks, will appear after transfer process.

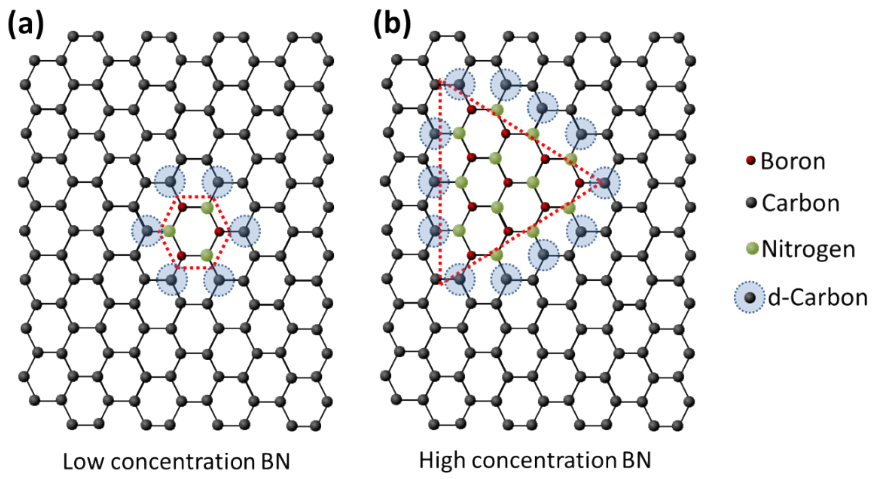

Figure S2. Proposed atomic model for the BNC film under (a) low BN concentration (smaller than 6 %) and (b) high BN concentration (over 8 %). The red, black and green circles denote the Boron, Carbon and Nitrogen atoms respectively. The circled atoms marked as d-Carbon represents carbon atoms at the boundary between graphene and BN domains.

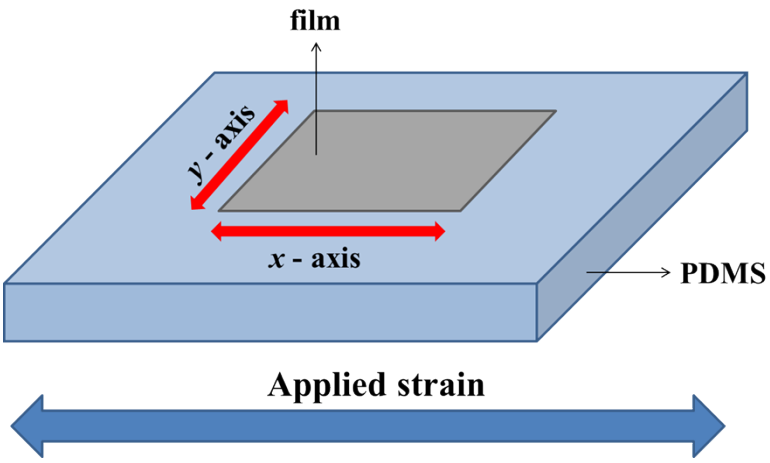

Figure S3. Schematic diagram of the *xy*-axis of Raman mapping used under applied PDMS strain.

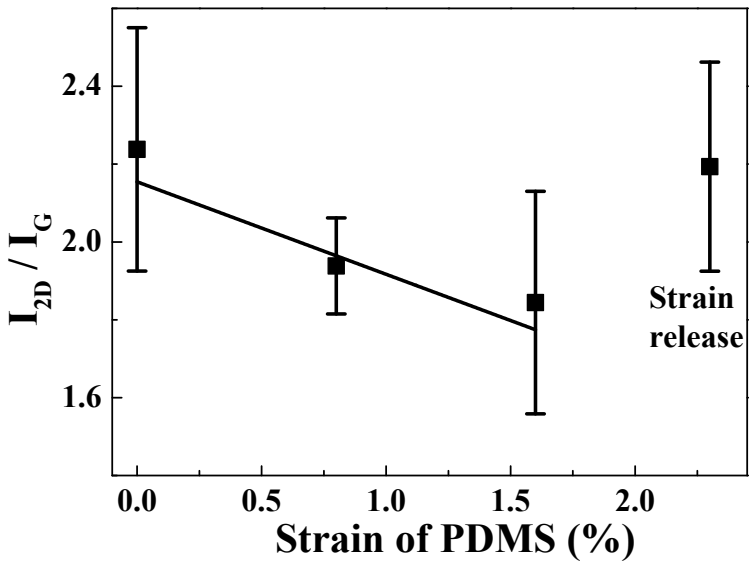

Figure S4. I_{2D} / I_G Raman ratio as a function of the PDMS strain for pristine graphene in the reversible deformation region

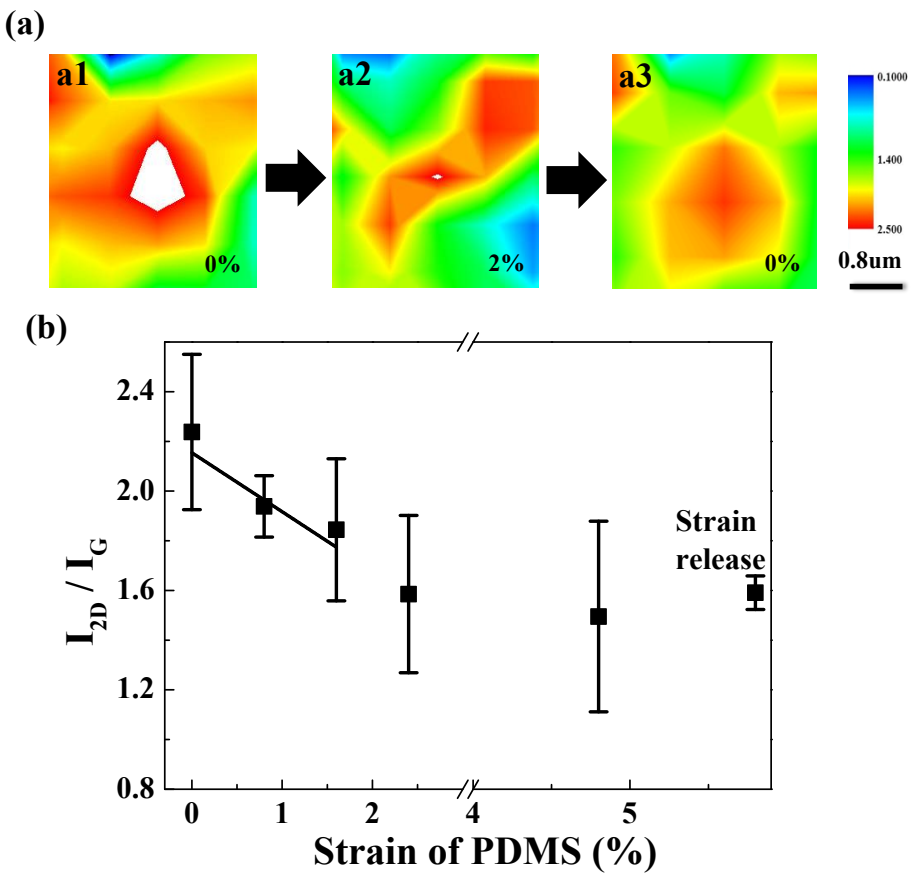

Figure S5. (a) Raman image of I_{2D} / I_G ratio for pristine graphene in the irreversible deformation region. (b) Raman I_{2D}/I_G ratio for pristine graphene as a function of strain of PDMS in irreversible region.

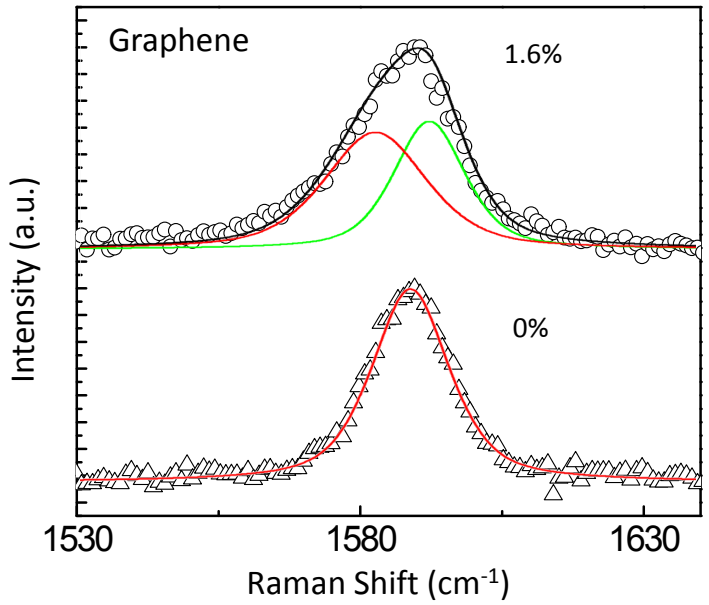

Figure S6. Raman G band for graphene before and under applied strain. The open symbols represent the experimental data and the solid colored lines show the deconvoluted peaks with the curve fitting.

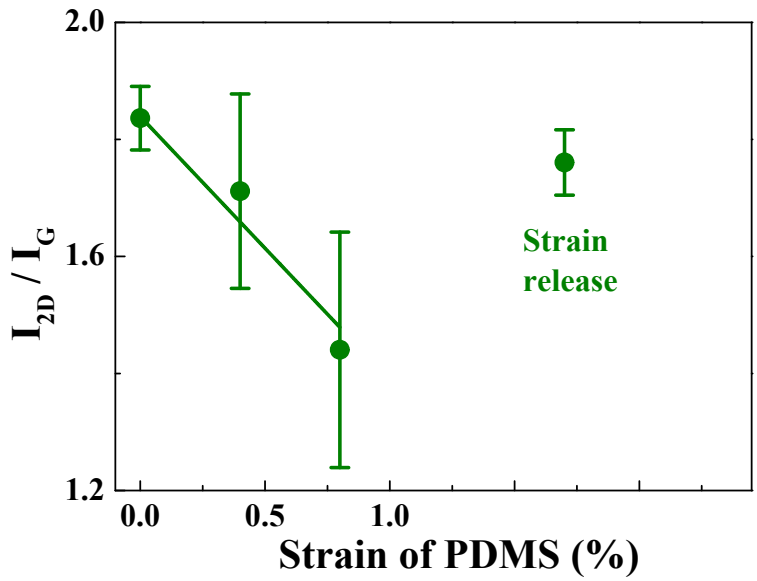

Figure S7. I_{2D} / I_G Raman ratio as a function of the PDMS strain for 2BNG film in the reversible deformation region

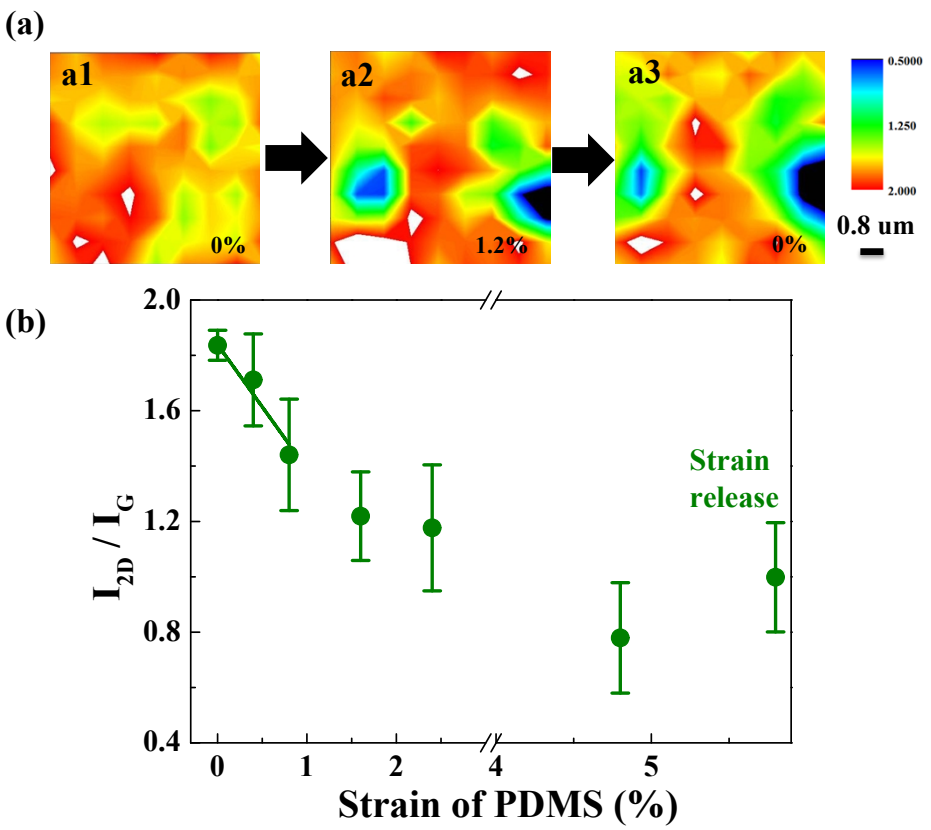

Figure S8 (a) Raman image of I_{2D} / I_G ratio for 2BNG in the irreversible deformation region. (b) I_{2D}/I_G Raman ratio for 2BNG as a function of strain of PDMS in irreversible region.

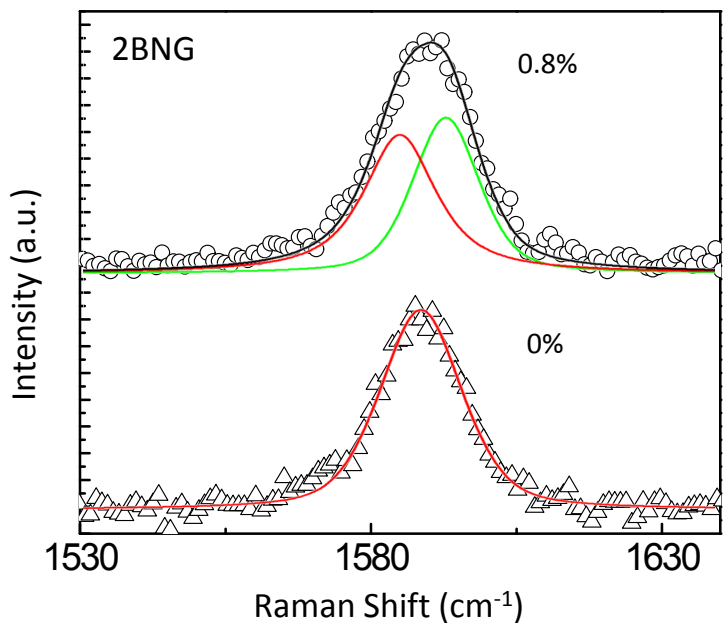

Figure S9. Raman G band for 2BNG before and under applied strain. The open symbols represent the experimental data and the solid colored lines show the deconvoluted peaks with the curve fitting.

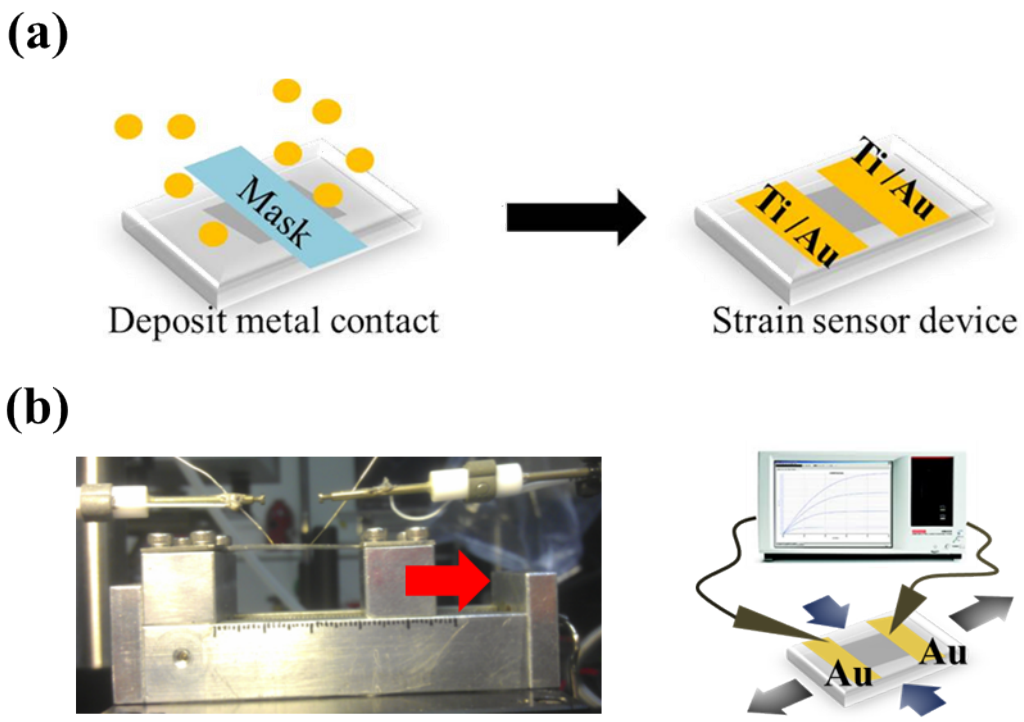

Figure S10. (a) The schematic diagram of deposition process for strain sensor device. (b) After deposition of metal contact, the device was placed on a home-made stage used for applying strain to sample/PDMS substrate. The electrical measurements were employed using Keithley model 4200-SCS system.

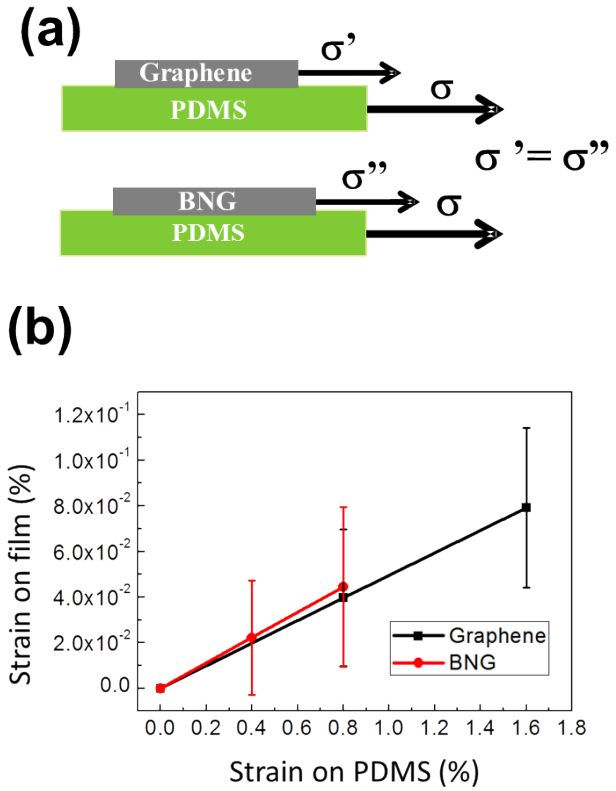

Figure S11. (a) Schematic diagram of (a) the 2D stress applied to graphene and BNG films (b) actual strain on graphene and BNG measured by Raman versus PDMS strain.

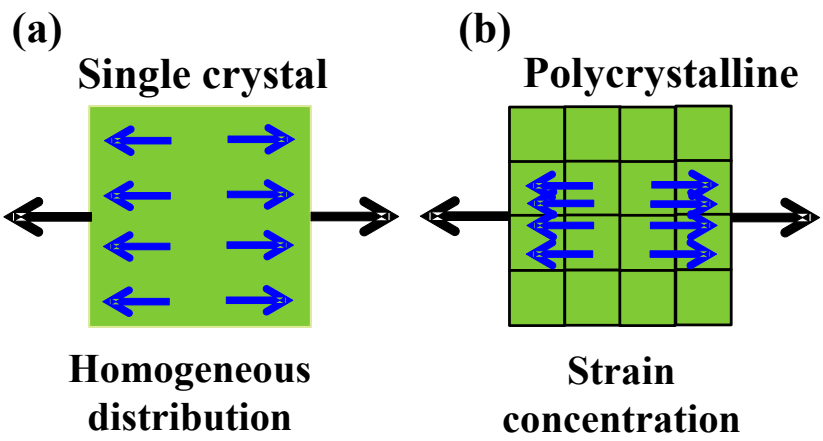

Figure S12. Schematic diagrams of strain distribution on (a) a strained single crystal applied to graphene and BNG films; (b) actual strain on graphene and BNG measured by Raman versus PDMS strain.