Supplementary information

Sample transferring on the DAC

The high technical challenge involved in the manipulation of graphene and its substrate in the restricted sample space characterizing the DAC required the development of a optimized drop-off technique. Figure S1 shows a substrate before its transfer in the DAC. Two weak links attach the disk to the rest of the Si/SiO_2 wafer from which it has been etched. The typical external diameter of the hole is $\sim$ 800 µm. To pick-up the sample we used thin tweezers which could be manipulated during microscope inspection of the sample. The weak links are broken using the tweezers and the disk attaches to it by simple electrostatic force. The sample was then carefully dropped on the anvil with minimal risk of damaging.

Once deposited on the anvil the Si/SiO_2 substrates needed to be glued in order to avoid displacements during the PTM loading phase. We used an UV optical-curing glue for this purpose (Norland Optical Adhesive 81) for which a thin layer was placed underneath the substrate. Only few minutes of curing was sufficient to guarantee that the substrate would not move during the DAC preparation or the experiment.

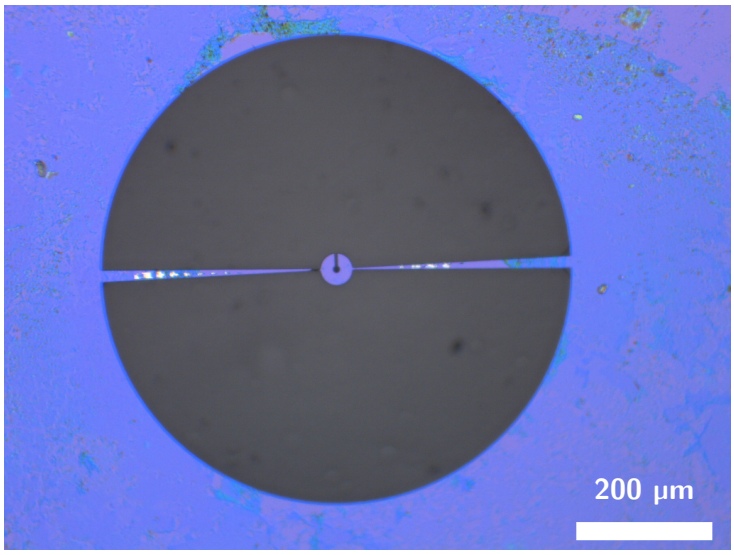


Figure S1: Typical Si/SiO_2 substrate connected via two weak links to the Si/SiO_2 50 µm-thick wafer.

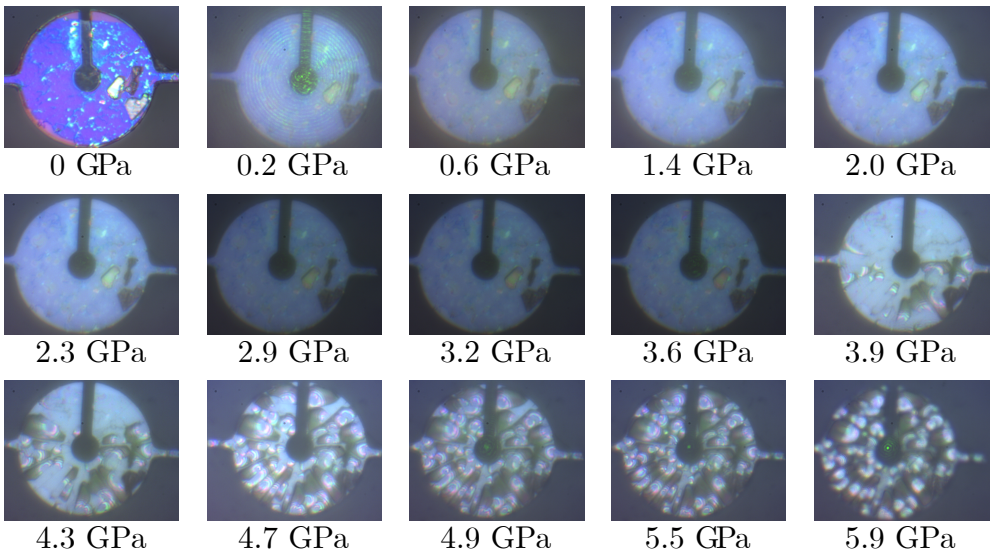
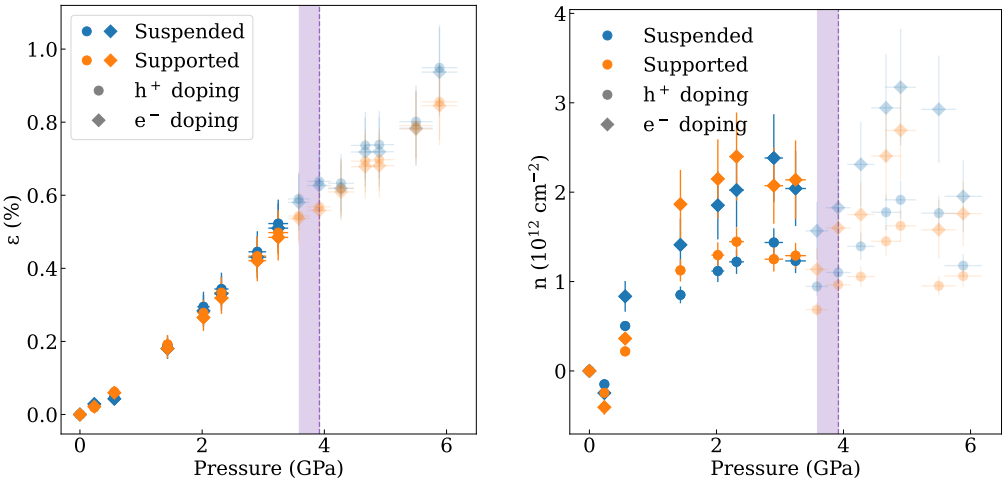


Figure S2: In-situ optical imaging of the sample at each pressure point. At 3.9 GPa the beginning of clear changes of the substrate morphology are caused by the delamination of the substrate's SiO_2 layer (285 nm thick).



(a) (b)

Figure S3: Evolution of the computed (a) strain and (b) doping in the sample with pressure. The hole doping (circle markers) and electron doping (diamond symbols) scenarios are compared.