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Measurement of mechanical properties of graphene using nanoindentation CHANGGU LEE, XIAODING WEI, JEFFREY KYSAR, JAMES HONE, Columbia University — Mechanical properties of graphene have been measured using AFM nanoindentation. Mono-, bi-, and tri-layer graphene sheets are suspended over micron-sized circular hole arrays. Force-displacement curves obtained by AFM nanoindentation allow the extraction of mechanical properties such as Young's modulus and fracture strength using equations for thin circular membranes. In order to verify the validity of the equations, the experimental and analytical results were compared with finite element simulation. The analytical equations fitted to the measurements show that Young's modulus is 0.9-1.2 TPa and the fracture strength is 90-150 GPa for up to 3 layers.

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