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Wrinkling of floating monoatomic graphene sheets[1] HERVE ELETTRO, FRANCISCO MELO, Universidad de Santiago de Chile, SOFT MATTER RESEARCH AND TECHNOLOGY CENTER (SMAT-C) TEAM — Graphene is a carbon-based honeycomb structure only one atom thick that combines exceptional thermal, electrical, optical and mechanical properties. Whereas conventional bulk and thin film materials have been studied extensively, the key mechanical behavior of 2D materials (cracking, folding) are barely explored, mainly due to complexity of manipulation. Reaching quantitative understanding of these phenomena will prove valuable to the production of high-quality graphene at industrial scale, applicable in a wide range of technologies such as wearable bio-sensors and supercapacitors. In that state of mind, we investigate the complex behavior of graphene under compression and bending in a free-floating configuration. This adaptative support allows study of graphene intrinsic properties both at large and local scales. We have optimized preparation protocols for production of few defects mm scale floating samples. We use capillary confinement and micromechanical indentation to induce wrinkling, folding and tearing of monoatomic graphene sheets. Graphene samples are characterized by high-resolution optical microscopy combined with confocal Raman analysis to assess its physical quality and monoatomic thinness. Our results show exciting insights into the unique mechanics of 2D membranes.

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