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Folding of Suspended Graphene Sheets JIONG ZHANG, Dept. of Mat. Sci. and Eng. and Mat. Research Lab, UIUC, Urbana, IL 61801, US, JIAN-LIANG XIAO, Dept. of Mech. Eng., NWU, Evanston, IL 60201, US, XIANHONG MENG, School of Aeronautic Sci. and Eng., Beihang Univ., Beijing 100191, China, CAROLYN MONROE, Dept. of Mat. Sci. and Eng., UIUC, Urbana, IL 61801, US, YONGGANG HUANG, Dept. of Cival/Envi. Eng. and Dept. of Mech. Eng., NWU, Evanston, IL 60201, US, JIANMIN ZUO, Dept. of Mat. Sci. and Eng. and Mat. Research Lab, UIUC, Urbana, IL 61801, US — Graphene, like a piece of paper, folds under mechanical force, resulting in a straight folded edge. The folded graphene edges have a nanotube-like surface structure, which possess unusual electronic properties and mechanical stability from the van der Waals attraction of folded graphene. Here we report a first systematic study of the atomistic structure of folded graphene and the energetics of graphene folding. We use graphene suspended in solution and free folding is achieved under random ultrasonic stimulations. This allows a statistically investigation of free folding of suspended graphene in all directions. The structure of the folded graphene is determined by nanoarea electron diffraction. Through a statistic measurement of about 100 folded graphene edges, we found the graphene preferentially folds along the symmetric directions. This preference is explained by a examination of graphene folding energetic and atomic simulation.

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