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Dynamic Negative Compressibility of Few-Layer Graphene, h-BN, and MoS_2[1] BERNARDO NEVES, ANA PAULA BARBOZA, HELIO CHACHAM, CAMILLA OLIVEIRA, THALES FERNANDES, Universidade Federal de Minas Gerais, ERLON MARTINS FERREIRA, BRAULIO ARCHANJO, Instituto Nacional de Metrologia, RONALDO BATISTA, ALAN OLIVEIRA, Universidade Federal de Ouro Preto — We report a novel mechanical response of few-layer graphene, h-BN, and MoS2 to the simultaneous compression and shear by an atomic force microscope (AFM) tip. The response is characterized by the vertical expansion of these two-dimensional (2D) layered materials upon compression. Such effect is proportional to the applied load, leading to vertical strain values (opposite to the applied force) of up to 150%. The effect is null in the absence of shear, increases with tip velocity, and is anisotropic. It also has similar magnitudes in these solid lubricant materials (few-layer graphene, h-BN, and MoS2), but it is absent in single-layer graphene and in few-layer mica and Bi2Se3. We propose a physical mechanism for the effect where the combined compressive and shear stresses from the tip induce dynamical wrinkling on the upper material layers, leading to the observed flake thickening. The new effect (and, therefore, the proposed wrinkling) is reversible in the three materials where it is observed.[2]

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[2]A. P. M. Barboza, H. Chacham, C. K. Oliveira, T. F. D. Fernandes, E. H. Martins Ferreira, B. S. Archanjo, R. J. C. Batista, A. B. de Oliveira and B. R. A. Neves, *Nano Lett.* **12**, 2313−2317 (2012).

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