Abstract Submitted
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Strain engineering on graphene directly from discrete atomic positions SALVADOR BARRAZA-LOPEZ, University of Arkansas, ALEJANDRO PACHECO SANJUAN, Universidad del Norte, ZHENGFEI WANG, University of Utah, MIHAJLO VANEVIC, University of Belgrade — Graphene's strain engineering can be considered as a "multiscale" theory where effective Dirac fermions (Quantum Mechanics) couple with the Classical Mechanics and Geometry of an elastic membrane. Since the seminal work by Suzuura and Ando, the coupling to mechanics and geometry has been given in terms of continuum elasticity theory in the harmonic regime and relies on Riemannian, continuum geometry (e.g., [1-4]). Given an atomistic conformation is known, we express the coupling among effective Dirac fermions and mechanics directly onto the atomistic lattice and without reference to a continuum media; i.e., we couple effective Dirac fermions with atomistic mechanics. The approach has a solid mathematical underpinning known as Discrete Differential Geometry (DDG) [5]. We will provide a number of specific insights from this atomic-originated framework [6,7]. 1. H. Suzuura and T. Ando, PRB 65, 235412 (2002); 2. V. M. Pereira and A. H. Castro Neto, PRL 103, 046801 (2009). 3. F. Guinea, and M. I. Katsnelson, and A. K. Geim, Nat. Phys. 6, 30 (2010). 4. M. A. H. Vozmediano, and M. I. Katsnelson, and F. Guinea, Phys. Rep. 496, 109 (2010); 5. A. I. Bobenko, P. Schroder, J. M. Sullivan, and G. M. Ziegler, eds., Discrete Differential Geometry. Springer. 1st Ed.; 6. J. V. Sloan, A. A. Pacheco Sanjuan, Z. Wang, C. Horvath, and S. Barraza-Lopez. PRB 87, 155436 (2013); 7. S. Barraza-Lopez, A. A. Pacheco-Sanjuan, Z. Wang, and M. Vanevic. Solid State Comm 166, 70 (2013).

Salvador Barraza-Lopez
University of Arkansas

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