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Quantum Sticking of Atomic Hydrogen to Graphene[1] YANTING ZHANG, IBM Microelectronics, ADAM DOHERTY, University of Vermont, ANDREW GERAGOTELIS, Siena College, DENNIS CLOUGHERTY, University of Vermont — We consider the low-energy behavior of the sticking probability of atomic hydrogen to suspended graphene. For energy transfer through the flexural modes of graphene, we find that the inelastic coupling falls in the subOhmic regime. Thus the effects of low-frequency fluctuations of the graphene sheet are crucially important for quantum sticking. We analytically solve for the low-energy asymptotic behavior of the sticking coefficient using a variational mean-field method [D.P. Clougherty and Y. Zhang, Phys. Rev. Lett. 109, 120401 (2012)]. We find that as a result of strong coupling to the low-frequency flexural modes of graphene, a new scaling law results. For suspended graphene at finite temperature, we find that at a critical incident energy, the sticking probability drops discontinuously; below this critical energy, the sticking probability is suppressed by the orthogonality catastrophe. We compare our nonperturbative variational results to those obtained by using Fermi's golden rule.

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