Tunable Superconductor-Insulator Transition in tin-doped Graphene.

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Over the past twenty years, the superconductor-insulator transition has been studied in a variety of systems, including thin films of Be, Bi, InOx and high-Tc superconductors. The parameters used to drive the transition can be film thickness, magnetic field, or, in some recent studies, the electric field [1] [2]. However, this subject remains controversial, as none of the existing theories (namely, the fermionic and the bosonic scenario) accounts for the whole corpus of experiments. Here we report measurements of superconductor-insulator transition in a new kind of device : tin-doped CVD graphene [3] . Bare CVD graphene exhibits insulating behavior at low temperatures. On the other hand, after Tin deposition, it experiences a Kosterlitz-Thouless transition towards a 2D superconducting state which critical temperature can be gate tuned. We show that upon changes in carrier density ($\pm 7.10^{12} \mathrm{cm}^{-2}$) and at intermediate magnetic fields, a transition from a superconducting to a truly insulating state can be induced. A phase diagram of the system can thus be inferred, and compared to the previously reported ones. This hybrid system appears to be an original platform to investigate the current understanding of the physics of the superconductor-insulator quantum phase transition.

[1] A.D. Caviglia et al, Nature **456**,624 (2008).
[2] K.A. Parendo et al, Phys. Rev. Lett., **94**,197004, (2005).
[3] B. Kessler et al, Phys. Rev. Lett., **104**, 047001 (2010).