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Gate-Tunable Superconducting-Insulating Transition in Tin-Decorated Graphene VINCENT BOUCHIAT, ZHENG HAN, ADRIEN ALLAIN, Neel Institute, CNRS-Grenoble — We report the measurement of electrostatically tuned superconducting-insulating transition in macroscopic, CVD-Grown samples of graphene which decorated with tin nanoparticles. The self assembled network of Tin islands generates superconducting correlations locally in the Graphene by means of proximity effect. Correlations eventually leads to percolation of a supercurrent This system exhibits features related to granular superconductivity, a giant magnetoresistance peak, as well as an intermediate metallic behavior. We emphasize outstanding dynamics of the transition, which exhibit a change in resistance of more than 7 orders of magnitude within 40V of gate voltage, thus realizing a real electrostatically driven superconducting-insulating transition. The intense positive magnetoresistance observed for fields below the critical field of Tin nanoparticles is a signature of the localization of Cooper pairs. This hybrid superconductor provides a model system to better understand the physics of inhomogeneous superconductivity, as crossing the transition by adjusting the carrier density is conceptually simpler than using a magnetic field. It also allows to cross the transition continuously and under constant disorder.

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