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Tailoring ultra-thin 2D nanomesh superconductors with robust superfluid density and extraordinary magnetotrasport properties[1] HYOUNGDO NAM, Department of Physics, The University of Texas at Austin, TX 78712, PHILIP ADAMS, Department of Physics and Astronomy, Louisiana State University, Baton Rouge, LA 70803, CHIH-KANG SHIH, Department of Physics, The University of Texas at Austin, TX 78712 — Uniform two-dimensional (2D) superconductors (SC) with strong spin-orbit coupling, such as Pb films, show robust superfluid rigidity and have parallel critical magnetic fields (˜50 T) that are much larger than Clogston-Chandrasekhar limit, as we previously reported. By tuning the epitaixial growth kinetics, we recently produced a 2D Pb nanowire network, which we term "nanomesh". The nanomeshes have a uniform thickness of 7ML and an average nanowire width of 40 nm. Depending on the growth conditions, the nanomesh can be tuned to be above or below percolation threshold. In-situ double-coil mutual inductance measurement shows very strong superfluid rigidity when the network is above percolation threshold but the superfluid rigidity is weakened significantly near the threshold. For 2D nanomeshes above the percolation threshold, magneto-transport measurements reveal extremely high parallel critical fields (estimated to be >100 T) as well as an anomalous perpendicular critical field temperature dependence. In addition, Little-Parks oscillations are observed in magneto-transport measurements near Tc.

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