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Reentrant phase coherence in a quasi-one-dimensional superconductor[1] DIANE ANSERMET, ALEXANDER P. PETROVIC, SHIKUN HE, Nanyang Technological University, DMITRI CHERNYSHOV, European Synchrotron Radiation Facility, MORITZ HOESCH, Diamond Light Source, DIALA SALLOUM, Lebanese University, PATRICK GOUGEON, MICHEL POTEL, University of Rennes 1, LILIA BOERI, Graz University of Technology, OLE K. ANDERSEN, Max Planck Institute for Solid State Research, CHRISTOS PANAGOPOULOS, Nanyang Technological University — Short coherence lengths characteristic of low-dimensional superconductors are related to high critical fields or temperatures. Fatally, such materials are often sensitive to disorder and suffer from phase fluctuations in the order parameter which diverge with temperature T, magnetic field H or current I. To solve synthesis and fluctuation problems, we propose to build superconductors from inhomogeneous composites of nanofilaments. Single crystals of quasi-one-dimensional $Na_{2-\delta}Mo_6Se_6$ featuring Na vacancy disorder ($\delta \sim 0.2$) behave as percolative networks of superconducting nanowires. Long range order is established via transverse coupling between individual filaments, yet phase coherence is unstable to fluctuations and localization in the zero-(T,H,I) limit. A region of reentrant phase coherence develops upon raising (T,H,I) and is attributed to an enhancement of the transverse coupling due to electron delocalization. The observed reentrance in the electronic transport coincides with a peak in the Josephson energy E_J at non-zero (T,H,I). $Na_{2-\delta}Mo_6Se_6$ is a blueprint for a new generation of low dimensional superconductors with resilience to phase fluctuations at high (T,H,I).

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