Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Gyroidal Mesoporous Niobium Nitride Superconductors from Block Copolymer Self-Assembly PETER BEAUCAGE, SPENCER ROBBINS, JAMES P. SETHNA, FRANCIS J. DISALVO, R. BRUCE VAN DOVER, SOL M. GRUNER, ULRICH WIESNER, Cornell University — Superconductors with mesoscale ordering and porosity are expected to have very different properties from their bulk counterparts. The exploration of these properties has been limited, however, by the lack of tunable, versatile, and robust wet-chemical synthesis methodologies to mesostructured superconductors. We report the synthesis of gyroidal NbN superconductors from gyroidal block copolymer self-assembly-derived niobium oxide. The resulting materials have a Tc of about 7.8 K, a critical current density of 440 A cm^{-2} at 100 Oe and 2.5 K, and a mesoscale lattice with the $I4_132$ (alternating gyroid) structure with d_{100} spacings between 27 and 36 nm. We will discuss recent efforts to improve the superconducting properties of these materials and to expand block copolymer-inorganic hybrid co-assembly to be a scalable, tunable platform for exploration of the impacts of mesoscale order and porosity on superconducting properties.

Reference

S. W. Robbins, P. A. Beaucage, H. Sai, K. W. Tan, J. P. Sethna, F. J. DiSalvo, S. M. Gruner, R. B. van Dover, U. Wiesner, *Block copolymer self-assembly directed synthesis of mesoporous gyroidal superconductors*, Sci. Adv. **2** (2016), e1501119.

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Date submitted: 17 Nov 2016 Electronic form version 1.4