Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Application of metamaterial nanoengineering to triple the superconducting critical temperature of bulk aluminum[1] VERA SMOLYANINOVA, KATHRYN ZANDER, THOMAS GRESOCK, CHRISTOPHER JENSEN, WILLIAM ZIMMERMAN, Towson University, JOSEPH PRESTIGIACOMO, MICHAEL OSOFSKY, Naval Research Laboratory, ZHEN XING, MUMTAZ QAZILBASH, College of William and Mary, IGOR SMOLYANINOV, University of Maryland — Recent experiments have shown the viability of the metamaterial approach to dielectric response engineering for enhancing the transition temperature, Tc, of a superconductor [1]. In this report, we demonstrate the use of Al2O3-coated aluminium nanoparticles to form the recently proposed epsilon near zero (ENZ) core-shell metamaterial superconductor [2] with a Tc that is three times that of pure aluminium [3]. IR reflectivity measurements confirm the predicted metamaterial modification of the dielectric function thus demonstrating the efficacy of the ENZ metamaterial approach to Tc engineering. The developed approach advances potentials for efficient nanofabrication of bulk aluminium-based metamaterial superconductors. These results open up numerous new possibilities of considerable Tc increase in other simple superconductors. [1]. V. N. Smolyaninova et al., Scientific Reports 4, 7321 (2014) [2] I. I. Smolyaninov and V. N. Smolyaninova, Phys. Rev. B 91, 094501 (2015). [3] V. N. Smolyaninova et al., Scientific Reports 5, 15777 (2015)

[1]This work was supported in part by NSF grant DMR-1104676.

Vera Smolyaninova
Towson University

Date submitted: 04 Nov 2015 Electronic form version 1.4