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Further Analysis of a Cooper Pair Insulator

Shawna M. Hollen  
*University of New Hampshire - Main Campus*

H Q. Nguyen  
*Brown University*

M D. Stewart Jr  
*Brown University*

J Shainline  
*Brown University*

Aijun Jin  
*Brown University*

*See next page for additional authors*

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Further Analysis of a Cooper Pair Insulator

Authors
Further Analysis of a Cooper Pair Insulator$^1$ S.M. HOLLEN, H.Q. NGUYEN, M.D. STEWART, JR, J. SHAINLINE, Brown University Physics Department, AJUN JIN, J.M. XU, Brown University Division of Engineering, J.M. VALLES, JR, Brown University Physics Department — Amorphous thin films of Bi deposited on a substrate with a Nano-Honeycomb (NHC) array of holes can exhibit a Cooper Pair Insulator (CPI) phase [1]. The transport in this state is dominated by the incoherent tunneling of Cooper Pairs between localized states. The resistivity is activated in temperature, and the magnetoresistance (MR) near the thickness-tuned Superconductor-Insulator Transition (SIT) exhibits a giant peak, as is found in thin films of InO$_x$ and TiN. In an effort to learn how the localization of pairs develops, we have investigated films deposited on substrates with different hole radii, order in the hole arrays, and surface roughness. We will present our latest findings on the common features describing the CPI phase, and how the above variations influence its properties and those of the thickness-tuned SIT in these amorphous films. [1] M. D. Stewart Jr., A. Yin, J. M. Xu, and J. M. Valles Jr., Science 318, 1273 (2007).

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