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Electronic Transport and Superconductivity in Bi Confined in a 200nm Opal Host[1] MICHAEL NIESKOSKI, Fairfield University, RYAN JOHNSON, STEVEN DISSELER, MICHAEL GRAF, Boston College, TITO HUBER, Howard University, AUSTIN HOWARD, ANVAR ZAKHIDOV, University of Texas at Dallas — While bulk bismuth at ambient pressure is not a superconductor, changes in morphology are known to induce superconductivity in Bi at low temperatures. We present a study of bismuth nanoparticle arrays fabricated by confining bismuth into a porous opal host consisting of close-packed 200 nm silica spheres. Electrical transport was studied down to temperatures of 0.3K and magnetic fields up to 2T. We find the onset of superconductivity at 4.4K (confirmed by AC magnetic susceptibility) and global superconductivity at a temperature of 1.3K. This two step transition is typical for granular superconductors. Measurements of the critical temperature in magnetic field show that the higher temperature transition consists of at least two transitions. The low temperature upper critical field was calculated to be approximately 0.82T. These results are discussed in terms of the morphologies, namely amorphous and granular structure, that are known to make Bi a superconductor, and the three characteristic sizes for the nanoparticles in that has been used to describe superconductivity in lead imbedded in these host materials

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