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The Search for Higher Temperature Superconductors: Two Case Studies[1]

MALCOLM BEASLEY, Stanford University

The recent confluence of optimism in the prospects for higher temperature superconductivity and the documented need for new higher temperature superconductors (if electric power applications above liquid nitrogen temperatures are to be possible) has simulated several focused programs in the search new and improved high-Tc superconductors. In this talk, we review these motivating factors and present the results of two case studies. The first is the study of the high Tc bismuthate superconductors to understand the mechanism of their superconductivity and the factors governing Tc. We find that the bismuthates are moderately correlated materials with a dynamically enhanced electron-phonon interaction that exhibit dimorphism and a sensitivity of Tc to disorder. The second is the study of Cu/CuO interfaces (for which evidence of trace high temperature superconductivity has been reported) at which we find a new proximity effect in which antiferromagnetism is induced into a metal (Cu) by proximity to a charge transfer insulator (CuO).

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