凝縮系物理学ゼミナール

日時：6月 30日 （水）13：30～

場所：理学部5号館　413号室

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「Finite size effects in superconducting nanograins: from theory to experiments」

The first part of the talk is devoted to a theoretical description of finite size effects in Bardeen Cooper Schrieffer (BCS) superconductors. Then we study superconductivity in single isolated Pb and Sn nanoparticles. In Sn nanoparticles we observe giant oscillations in the superconducting energy gap with particle size leading to enhancements as large as 60

Theoretically, these finite size effects are described quantitatively by introducing finite-size corrections to BCS model. For Pb grains we have also observed that, at low temperatures, the superconducting gap diminishes as the grain size is reduced. By contrast, for sufficiently small grains, the gap is finite even for temperatures higher than then the mean field critical temperature. A model including thermal fluctuations and the leading low temperature corrections to mean field provides a quantitative description of the system. Our study paves the way to exploit quantum size effects in boosting superconductivity in nanograins.

Reference:

Sangita Bose, Antonio M. García-García, Miguel M. Ugeda, Juan D. Urbina, Christian H. Michaelis, Ivan Brihuega and Klaus Kern: "Observation of shell effects in superconducting nanoparticles of Sn" Nature Materials, in press.