# Closing the 'Pseudogap' on Superconductivity

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One of the biggest mysteries in studying high-temperature (Tc) superconductors - materials that conduct electrical current with no resistance below a certain transition temperature - is the origin of a gap in the energy level of the materials' electronic spectrum. Brookhaven physicist Hongbo Yang presented his latest research on this "pseudogap" on Monday at the American Physical Society meeting.

Understanding the pseudogap may help scientists understand the mechanism for high-temperature superconductivity, which in turn could lead to the strategic design of superconductors for practical applications such as high-capacity, highly efficient power transmission lines.

There are competing theories for the origin of the pseudogap. In one, the material is considered a normal metal from which superconductivity starts to emerge via the pairing of electrons. In another, the pseudogap is thought to reflect the competition between superconductivity and another condition of the material - some other "ground state."

"Our new results indicate that the first theory is clearly incorrect, these are not normal metals that simply become superconductors," said Yang.

Yang presented his results of how the gap changes at various temperatures and with various levels of doping - that is, with different amounts of various other atoms added to the material.

"The results show that the underdoped system in the normal state

behaves differently from all regions of the phase diagram in the superconducting state, and point to potentially different origins for the pseudogap," he said.

Source: Brookhaven National Laboratory