Paving the Way for Crystal Growth

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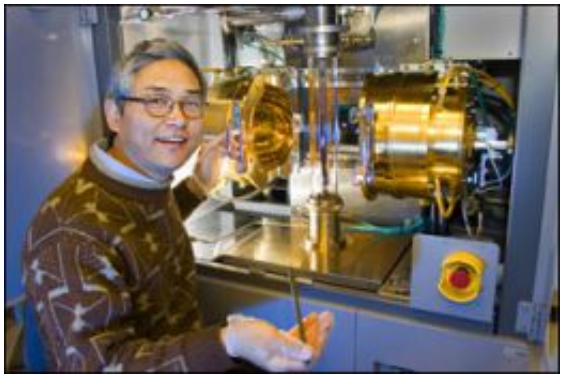

Genda Gu

In order to study the properties of LBCO superconductors, scientists need to produce large, single crystals of the material - a difficult task that wasn't possible until recently. At the state-of-the-art crystal growth facility in Brookhaven's physics building, physicist Genda Gu and his colleagues have perfected the process. Gu discussed his crystal growth method at the March 2007 meeting of the American Physical Society.

The crystals are grown in an infrared image furnace, a machine with two mirrors that focuses infrared light onto a feed rod, heating it to about 2,200 degrees Celsius (3,992 degrees Fahrenheit) and causing it to melt.

Under just the right conditions, Gu and his colleagues can make the liquefied material recrystallize as a single uniform crystal. At present, the most interesting form of LBCO has one barium atom for every eight copper atoms, or a 1/8 "doping," at which point the material loses its superconductivity. Achieving this high barium concentration is extremely difficult and is the reason many scientists previously opted to use different but related materials for their research on superconducting stripes and other properties, Gu said.

"LBCO was the first high-temperature superconductor discovered, but everyone switched over to studying other materials for a while because they weren't able to grow single crystals with a concentration of barium greater than 11 percent," Gu said. "Now, we can study the whole class of high-Tc materials."

Each crystal takes about a month to make, with precise control over growth temperature, atmosphere, and other factors. Brookhaven is currently capable of making crystals with barium concentrations up to 16.5 percent, a world record, Gu said.

Source: BNL