A new superconductor found by sprinkling Cu atoms

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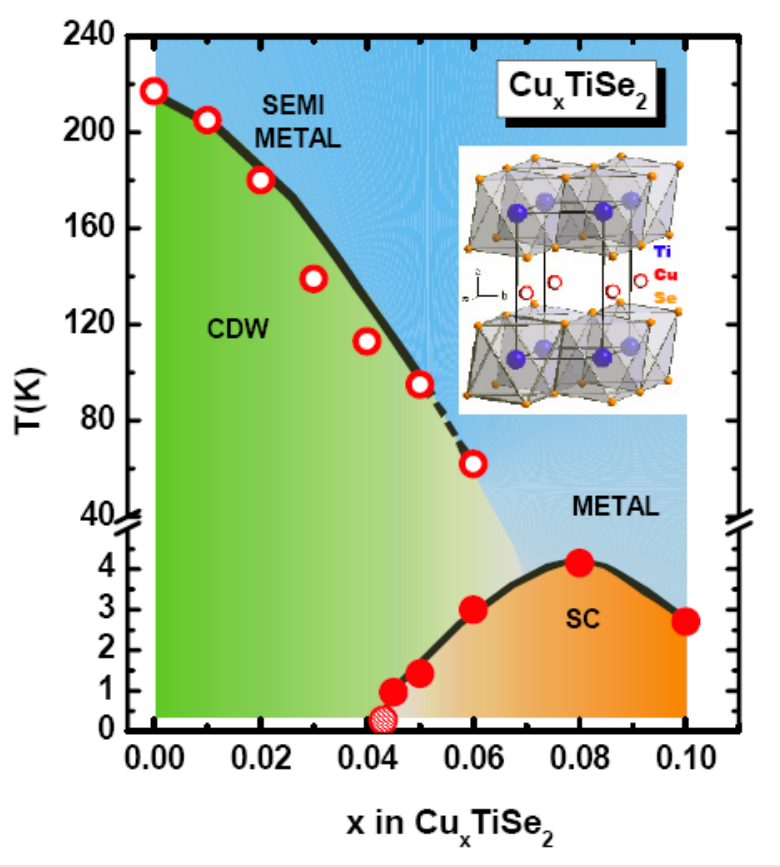
Superconductors can carry a large amount of electrical current without producing any wasteful heat. They are used to produce the magnetic field in medical resonance imaging (MRI) units. In future applications, superconductors may help to stabilize the national power grid while reducing waste in transmission. They may also lead to improved ship propulsion. The search for new superconductors is an intense, worldwide activity. Recently, Cava, Ong and postdoc Emilia Morosan found that adding copper atoms into a layered material $TiSe_2$ produces superconductivity[1]. The Cu atoms donate electrons which form Cooper pairs when the temperature is cooled below 4 K. The process also destroys an unusual electronic state called the charge-density-wave state which competes with superconductivity (figure). Although the critical temperature here (4 Kelvin) is much lower than that in the high-temperature superconductors, the phase diagram, suggestive of competing states, resembles that of the cuprates. Researching the competition in Cu_xTiSe_2 may help elucidate the phase diagram of the high-*T*c cuprates.

1. E. Morosan et al., Nature Physics **2**, 544 (2006).



The phase diagram of Cu_xTiSe_2 in the plane of T (temperature) versus x (Cu content). As x increases from 0, the charge-density-wave (CDW) state is suppressed. Superconductivity emerges when x exceeds 4 percent (orange dome). The inset shows the crystal structure. Cu ions (red circles) are sandwiched between layers of Ti (blue) and Se atoms (orange).