Brett Green: Physics
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Superconductivity in Alkali-doped Dibenzopentacene

In November 2011, a group of Chinese researchers set a new record at thirty-three kelvins for the highest critical temperature of any non-fullerene organic superconductor. The compound was potassium-doped dibenzopentacene in a particulate form. Our project's goal is to reproduce their results and attempt to improve upon the superconducting activity seen so far by crystallizing the dibenzopentacene sample. We will determine both the critical temperature and the temperature-dependent resistivity of both non-crystalline and crystalline dibenzopentacene, and then compare our results with those already published.

Samples, purchased from chemical suppliers, will be doped by direct heating of the dopant alkali with the sample in a sealed quartz tube. The literature also describes a method of doping in solution.

We will employ the gas antisolvent process and solvent pair method, both of which involve precipitation from solution, in our efforts to generate crystals. Should we encounter other possible methods early on, we may try them as well.

Analysis will be performed using a “Physical Property Measurement System.” We will determine critical temperature by watching for a sudden change in magnetic susceptibility. Electrical resistivity will be found using test voltages and probes.