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The mechanism of superconducting pairing in doped strontium titanate.

Strontium titanate is a semiconducting material, which can be tuned to become ferro-electric by substituting the heavier 18^O isotope for the natural 16^O isotope. When doped with electrons, the material becomes a good metal with a resistivity that rises with temperature proportional to T^2. The doped material is superconducting at low temperatures, even down to doping levels where the average distance between the conduction electrons is more than 200 Angstrom. This state of affairs has lead to many speculations as to the mechanism that binds the electrons together in Cooper-pairs. Among the many proposals, the interplay between ferro-electricity and superconducting pairing has been particularly prominent in recent years and has lead to the prediction of a very large increase of superconducting Tc with 18^O isotope substitution. We have studied this phenomenon experimentally by preparing these samples, by doping them, and studying their transport and optical properties. I will discuss these experimental data and their theoretical implications for the physics of superconductivity in doped SrTiO3.