ENHANCEMENT OF SUPERCONDUCTIVITY AT HOMOGENEOUS HIGH PRESSURE IN HG-BASED MULTILAYER CUPRATES

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We have measured the electrical resistivity of Hg-based cuprate superconductors denoted by the formula $HgBa_2Ca_{n-1}Cu_nO_{2n+2+\delta}$(n; number of the CuO_2 planes in the unit cell) at high pressures. In $HgBa_2Ca_2Cu_3O_{8+\delta}$(Hg-1223, n=3), which has the highest bulk T_c at atmospheric pressure, we observed the enhancement of T_c of 153 K at 15 GPa[1] with zero resistivity which is the highest transition temperature of superconductivity until the discovery of the pressure-induced superconductivity of H_2S[2]. We have observed T_cs at high pressure in different n Hg-based cuprates.

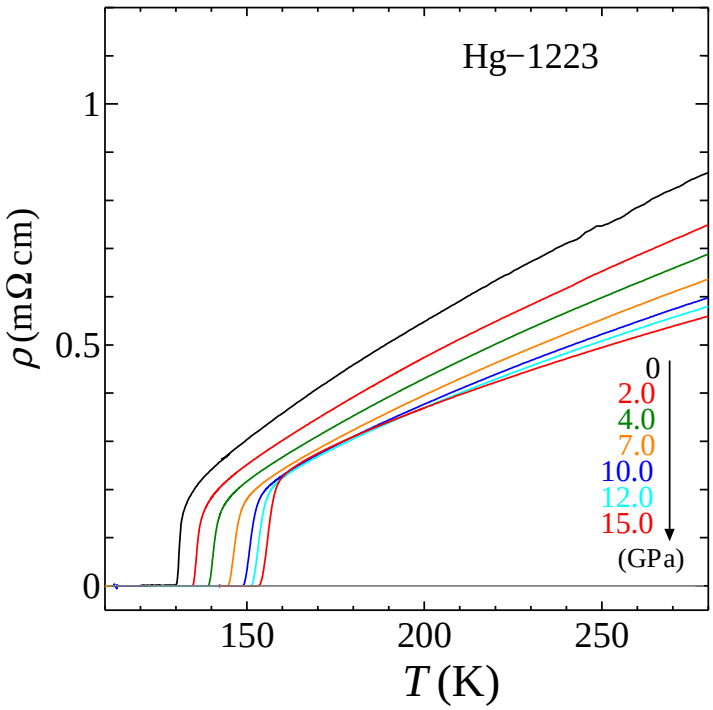

Figure: Resistivity of optimally doped Hg-1223 at high pressure.

Superconducting transition temperature are increased by the application of pressure. The slope at atmospheric pressure, dT_{c0}/dP, is ~+2.5 K/GPa, in any n. At high pressure region, the enhancement of T_c seems to be saturated. Especially in Hg-1256, T_c clearly decreases at above 8 GPa. Probably there will be a competition between in-plane and out-of-plane pressure effects.

In this talk, we will also show a technique for measurements at 'high and isotropic' pressure. Non-isotropic(uniaxial) high pressure sometimes destroys superconductivity of bulk compounds notably with an anisotropic crystal structure. We have employed cubic anvil type apparatus for many years to avoid uniaxial high pressure effects.

[1] N. Takeshita, A. Yamamoto, A. Iyo, H. Eisaki, J. Phys. Soc. Jpn. **82**, 023711 (2013).
[2] A.P. Drozdov, M.I. Eremets, I.A. Troyan, V. Ksenofontov, S.I. Shylin, Nature **525**, 73 (2015).