A Theoretical Study of Tunneling Spectra in $PrOs_4Sb_{12}$

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Superconductivity in the cubic skutterudite $PrOs_4Sb_{12}$ (POS) has received a great interest in recent years since it has two superconducting phases [1]. Nowadays such two superconducting phases are well known in a spin-triplet superconductor UPt_3 and a superfluid ^3He. So far, the mechanism of superconductivity and the pairing symmetries in the two phases have been discussed in a number of studies. A NQR experiment shows the absence of the coherence peak, which suggests that POS is an unconventional superconductor. A thermal conductivity experiment indicates 6 point nodes at (1,0,0) direction and directions equivalent to (1,0,0) for the high temperature phase. On the basis of experimental results, unconventional pairing symmetries have been proposed such as anisotropic s, $s + id$ and p wave symmetries.

A measurement of the tunneling spectra is a useful tool to analyze the pairing symmetries of unconventional superconductors because the tunneling spectra are essentially anisotropic in real space and reflect internal inforemation of the pair potentials. In the presentation, firstly, we briefly expaline the reasons in the case of high-T_c superconducting junctions. Secondly, we discuss the tunnering spectra in POS for pair potentials which have been propsosed in recent theories. The conductance is sensitive to the relation between the directions of currents and the position of point nodes. In some cases, shapes of the conductance deviate from those of the bulk density of states. In the spin-singlet pairing, we found that the conductance vanishes in the limit of the zero-bias for most candidates. While in the spin-triplet pairing, the results show peak structures in the sub gap conductance for most candidates. Finally, the calculated results are compared with a recent experiment[3].

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(2) Y. Asano, Y. Tanaka, Y. Matsuda and S. Kashiwaya, Phys. Rev. B **68**, 184506 (2003).
(3) H. Suderow, et. al., cond-mat/0306155.