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Knight shift studies of unconventional superconductors: perspective of the Knight shift in $PrOs_4Sb_{12}$

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We report the present status of the Knight-shift (K) in $PrOs_4Sb_{12}$, where ^{121}Sb K (^{121}K) results of $PrOs_4Sb_{12}$ are compared to the results of other unconventional superconductors. We will also mention the underlying issues and a perspective of the K in $PrOs_4Sb_{12}$.

- $PrOs_4Sb_{12}$[1] (Odd-parity?): For field parallel to [001] direction, ^{121}K does not change below T_c, suggesting the odd-parity state. The crystal symmetry is T_h; nevertheless the rotation angle dependence of ^{121}K measurements shows that the ^{121}K for $[0\bar{1}0]$ direction changes below T_c. This suggests that the spin-degree of freedom of the Cooper pairs is frozen with a crystal axis though its origin is not clear at present.

- UPt_3[2] (Odd-parity): No reduction of ^{195}Pt-K (^{195}K) was observed for the C phase, indicating the odd-parity state. At low fields in the B phase, the respective ^{195}K's for $H \parallel b-$ and $c-$axis decrease below T_c, whereas ^{195}K for $a-$axis does not change across T_c. The change in ^{195}K for $H \parallel b-$ and $c-$axis is considerably small, comparable to the KS in pure metal. These results can be interpreted by either the incomplete lock of the **d**-vector to crystal axis or the intrinsic properties in f^2 configuration predicted theoretically.[10]

- UNi_2Al_3 [3](Odd-parity): No change of ^{27}Al K (^{27}K) was observed below T_c for $H \perp c$ axis, indicating the odd-parity pairing state.

- URu_2Si_2 [4], UBe_{13} [5](Odd-parity?): No change of K was observed below T_c, suggesting an odd-parity state. (Detailed K studies have not put forth yet.)

- Sr_2RuO_4 [6] (Odd-parity): No change of K was observed below T_c, irrespective of the applied field directions. The **d**-vector rotates freely as $\mathbf{d} \perp H$, suggesting the pinning field for the pairs is not so weak.

- $CeCu_2Si_2$ [7], UPd_2Al_3 [8], $CeCoIn_5$ [9], High-T_c cuprates (Even-parity): K's decrease below T_c, irrespective of the applied field direction. Moreover, the fractional decrease of the K is in agreement with the quasi-particle spin susceptibility estimated from the heavy Fermi-liquid relation. These results indicates the even-parity state.

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