Determination of the magnetic structure of $CePt_2In_7$ by means of neutron diffraction

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$CePt_2In_7$ is a recently discovered heavy fermion material belonging to the same family as the well-known $CeIn_3$ and $CeRhIn_5$ compounds. However, the spacing between Ce-In planes in $CePt_2In_7$ is drastically increased[1] as compared to its $CeRhIn_5$ counterparts, implying a more two-dimensional crystal structure.

While the magnetic structure of the cubic $CeIn_3$ is characterized by a simple commensurate ordering wave vector (1/2, 1/2, 1/2)[2], that of the more two-dimensional $CeRhIn_5$ is more complicated. Its magnetically ordered ground state is an incommensurate helicoidal phase with the propagation vector q_M = (1/2, 1/2, 0.297) and the magnetic moment in the basal plane of the tetragonal structure[3].

The magnetic structure of its antiferromagnetic (AF) ground state is still an open question. The existing reports on this matter are controversial: some of them exhibit a coexistence of commensurate and an incommensurate[4] AF orders while others show a commensurate[5] order only. All these experiments lead to the same conclusion: the magnetic propagation vector is (1/2, 1/2, δ), although the value of δ is not predicted.

I will present determination of the magnetic structure of the heavy fermion antiferromagnet $CePt_2In_7$ by single crystal neutron diffraction. We find a magnetic wave vector q_M = (1/2, 1/2, 1/2), which is temperature independent up to T_N = 5.5 K. A staggered moment of 0.45(1)μ_B at 2 K resides on the Ce ion. The nearest-neighbor moments in the tetragonal basal plane are aligned antiferromagnetically. The moments rotate by 90° from one $CeIn_3$ plane to another along the c-axis (see figure).

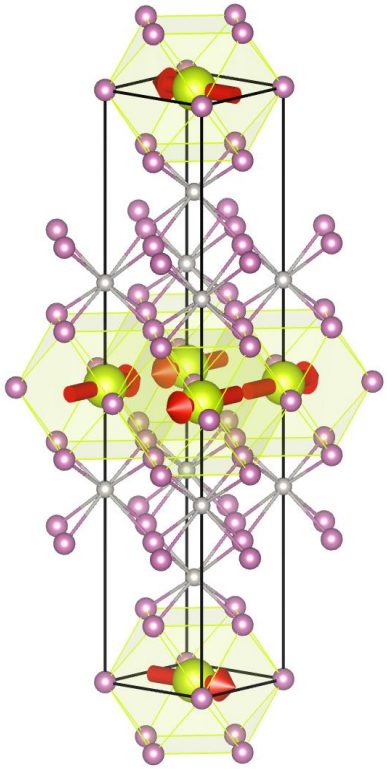

Figure. Crystal structure of $CePt_2In_7$ (Ce: yellow, Pt: grey, In: purple) with magnetic moments (red arrows).

References

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