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de Haas–van Alphen effect in $\text{SmFe}_4\text{P}_{12}$

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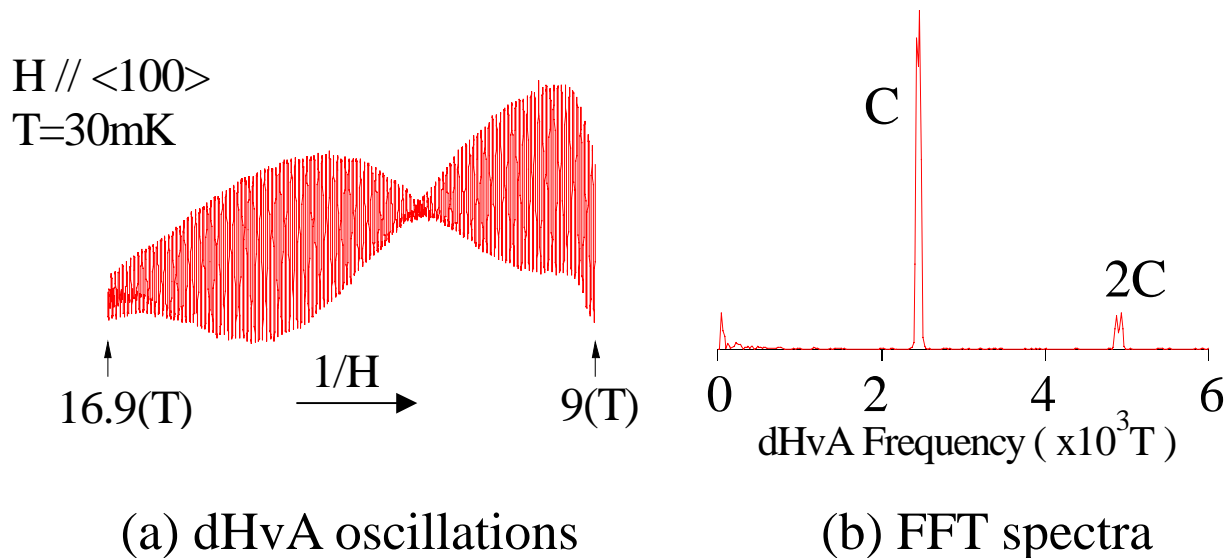
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The filled skutterudite compound $\text{SmFe}_4\text{P}_{12}$ is reported to be the first Sm-based heavy fermion with ferromagnetic ground state [1]. We have succeeded in growing high quality single crystals of $\text{SmFe}_4\text{P}_{12}$ and observing the de Haas-van Alphen (dHvA) effect in this compound.

Figures show (a) the typical dHvA oscillations and (b) the fast Fourier transformation (FFT) spectra of $\text{SmFe}_4\text{P}_{12}$. The beat seen in (a) is due to the slight difference of the dHvA frequencies between up- and down-spin bands split by the Zeeman effect. The branch denoted as C is observed in the whole field directions with a weak angular dependence, suggesting a nearly spherical Fermi surface. Compared to $\text{LaFe}_4\text{P}_{12}$ [2], the branch C in $\text{SmFe}_4\text{P}_{12}$ is similar to the branch c in $\text{LaFe}_4\text{P}_{12}$, suggesting the topology of the Fermi surface of $\text{SmFe}_4\text{P}_{12}$ is similar to that of $\text{LaFe}_4\text{P}_{12}$, localized character of $4f$ -electrons in Sm. The cyclotron effective mass m_c^* of $\text{SmFe}_4\text{P}_{12}$ is $4.3\sim 9.2m_0$ which is $2\sim 3$ times larger than that of $\text{LaFe}_4\text{P}_{12}$.



[1] N.Takeda and M.Ishikawa, J.Phys. Condens Matter 15 (2003) L229 - L233

[2] H.Sugawara *et al.*, Phys. Rev. B 66, 134411 (2002)