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Optical Conductivity and Electronic Structures of Ce-Filled Skutterudites

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We have measured optical conductivity spectra $\sigma(\omega)$ of six members of CeT_4X_{12} (T=Fe, Ru, Os and X=P, Sb). In contrast to our previous work [1], a single crystal sample was used for $CeFe_4Sb_{12}$. The measured $\sigma(\omega)$ spectra of the single crystal $CeFe_4Sb_{12}$ were, however, very similar to those previously measured on polycrystals. The temperature variation of $\sigma(\omega)$ is small compared with those of $CeOs_4Sb_{12}$ and $CeRu_4Sb_{12}$, probably meaning that the c-f hybridization state in $CeFe_4Sb_{12}$ at low temperatures is less developed than those in the other two compounds, although the lattice constant of $CeFe_4Sb_{12}$ is smaller and a stronger hybridization is expected. This might be due to the fact that the Ce filling in the $CeFe_4Sb_{12}$ single crystal was about 90 % [3]. Previous optical works on $CeFe_4P_{12}$ by UCSD group [2] were performed on samples showing widely varying electrical resistivities. Accordingly, their $\sigma(\omega)$ spectra of $CeFe_4P_{12}$ showed a marked Drude component for samples having small resistivities. Our data show insulator-like spectra, and no strong Drude component at and below room temperature, which is consistent with the low carrier density measured on our sample. The $\sigma(\omega)$ spectra of $CeFe_4Sb_{12}$ and $CeFe_4P_{12}$ are compared with our previous data on the other compounds, and the variations of their electronic structures are systematically analyzed.

[1] M. Matsunami et al., J. Magn. Magn. Mater. **272-276**, e41 (2004).
[2] S. V. Dordevic et al., Phys. Rev. B **60**, 11321 (1999).
[3] H. Sugawara et al., unpublished.