Inelastic Neutron Scattering Study of $\text{Ce}_3\text{Sn}$ and $\text{Ce}_3\text{In}$

C.H. WANG, J.M. LAWRENCE, University of California, Irvine, CA, 92697 USA, A.D. CHRISTIANSON, Oak Ridge National Laboratory, Oak Ridge 37831, TN USA, E.A. GOREMYCHKIN, ISIS Facility, Rutherford Appleton Laboratory, Chilton, Didcot, OX11 0QX, United Kingdom, E.D. BAUER, Los Alamos National Laboratory, Los Alamos, NM, 87545 USA, N.R. DE SOUZA , A.I. KOLESNIKOV, Argonne National Laboratory, Argonne, IL 60439 USA — In $\text{Ce}_3\text{Sn}$ and $\text{Ce}_3\text{In}$, the linear coefficients of specific heat $\gamma$ are $260 \text{ mJ/molCe}^{-2} \text{ K}^2$ and $700 \text{ mJ/molCe}^{-2} \text{ K}^2$, respectively. The Wilson ratio is 7.0 for $\text{Ce}_3\text{Sn}$ and 11.5 for $\text{Ce}_3\text{In}$. Such large values suggest the presence of ferromagnetic correlations in the ground state. Hence, this system is a potential candidate for studying the magnetic instability at a quantum critical point (QCP). As an initial measurement, we have measured the magnetic inelastic neutron scattering line shape of polycrystalline samples to determine the crystal field (CF) excitations. The low temperature spectrum of both $\text{Ce}_3\text{Sn}$ and $\text{Ce}_3\text{In}$ consist of a quasi-elastic line and two obvious inelastic lines resulting from the two excited crystal field doublets of $\text{Ce}^{3+}$ in the tetragonal symmetry. The quasi-elastic linewidth, which is related to the Kondo scale, is $3.2\text{ meV}$ for $\text{Ce}_3\text{Sn}$ and $1.5\text{ meV}$ for $\text{Ce}_3\text{In}$, consistent with the linear coefficients of specific heat. For $\text{Ce}_3\text{Sn}$ the two CF excitations are at $20\text{ meV}$ and $35\text{ meV}$ while for $\text{Ce}_3\text{In}$, the splitting is much larger giving the two excitations at $15\text{ meV}$ and $47\text{ meV}$.

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