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Elastic properties of Pr-based skutterudite compounds

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We have investigated the elastic property of Pr-based skutterudite compounds by means of ultrasonic measurement. In our group the following materials have been studied so far, $PrFe_4P_{12}$, $Pr_xLa_{1-x}Fe_4P_{12}$, $PrRu_4P_{12}$ and $PrOs_4Sb_{12}$. We will talk mainly our recent result of $PrRu_4P_{12}$ in this meeting. Figure 1 shows the temperature dependence of elastic constants C_{11}, $(C_{11}$-$C_{12})/2$ and C_{44} of $PrRu_4P_{12}$. A distinct bend was observed at the metal-insulator transition temperature of 62 K in all measured elastic constants. Fyrthermore, a pronounced softening towards low temperature was observed in C_{11}, $(C_{11}$-$C_{12})/2$, whereas, no softening was observed in C_{44}. These findings indicate that Γ_{23} non Kramers doublet plays an important role at low temperatures in terms of crystalline electric field (CEF) effect. We will discuss the $4f$-ground state of Pr ions in $PrRu_4P_{12}$, and compare our model with that deduced by the recent inelastic neutron measurement.

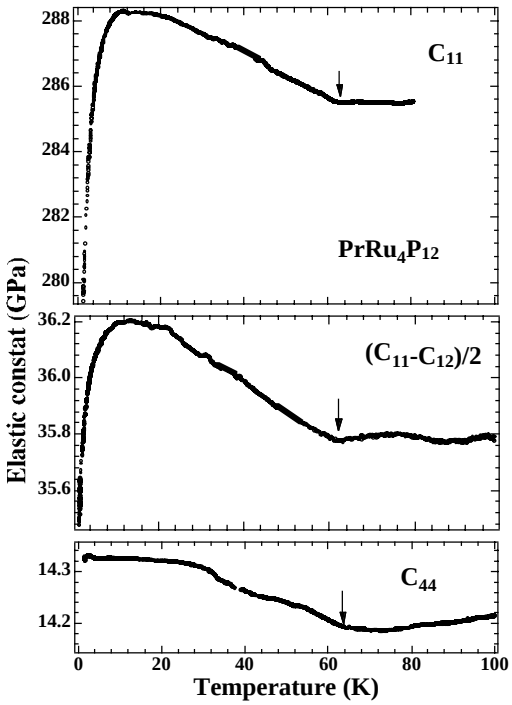

Figure 1: Temperature dependence of elastic constants C_{11}, $(C_{11}$-$C_{12})/2$ and C_{44} of $PrRu_4P_{12}$.

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