

# Inelastic neutron scattering of YbPd

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YbPd is a Yb valence fluctuating compound with a CsCl-type structure. This compound exhibits four successive phase transitions at low temperature [1]. Two higher phase transitions are known as structural transitions [2, 3]. Since the Yb atoms in this compound have valence degrees of freedom, correlation between valence and structural degrees of freedom in these phase transition has been discussed [2, 3].

Lattice instabilities were also investigated by inelastic X-ray scattering (IXS) [4, 5]. Softened branches were found at 300 K at the longitudinal X point and the reciprocal point between the longitudinal X point and R point, which correspond to the reciprocal positions connected with commensurate and incommensurate structural transitions in YbPd. However, the observed phonon dispersion relation differs from those in conventional charge density wave compounds: phonon softening is observed in wide reciprocal lattice space; such phonon dispersion relations were discussed on the theoretically viewpoint of valence-lattice interaction [6]. Correlation between temperature dependence of the quasielastic peak and Yb valence fluctuation was also discussed in the recent IXS work [5].

Motivation of the present work is distinguishment of the observed excitations in the previous IXS work [5] from pure phonon excitations. As mentioned above, coupling between phonon and electronic excitations was theoretically proposed in Ref. [6]. On the other hand, neutrons are scattered by nuclei, whereas X-rays are scattered by electrons. In addition, inelastic neutron scattering (INS) is complementary to IXS in dynamical structure factor related to phonon excitations.

We have carried out INS at GPTAS of JRR-3. The INS spectra shown in Fig. 1 were measured at various temperatures. The temperature dependence of the INS spectra measured at the X-point qualitatively agree with the IXS

reported in Ref. [5]. One of the possible origins of observed phonon softening might be caused by a nesting condition in YbPd. To discuss the relationship between the softened phonon mode and nesting condition, the resolution of the momentum transfer is required in measurement of dynamical structure factor. Since the INS spectra shown in Fig. 1 were measured with the focusing instrument, uncertainty of the momentum transfer is much larger than that in the IXS experiment [5]. To achieve the purpose of the experiment, INS measurement with higher momentum resolution would be required.

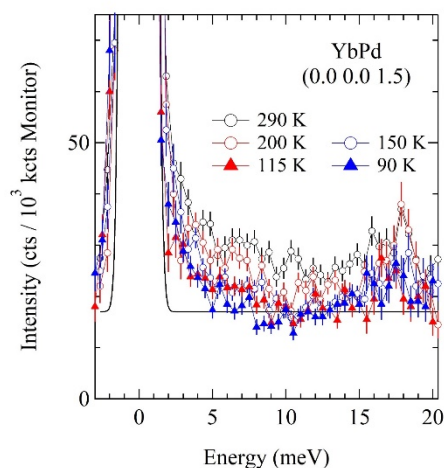


Fig. 1. Inelastic neutron scattering spectra of YbPd at various temperatures.

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