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Elastic property of a high-field ordered state observed in $PrFe_4P_{12}$ YOSHIKI NAKANISHI, TAKUYA FUJINO, PEIJIE SUN, MITSUTERU NAKAMURA, MASAHITO YOSHIZAWA, Iwate Univ., HITOSHI SUGAWARA, Tokushima Univ., DAISUKE KIKUCHI, HIDEYUKI SATO, Tokyo Metropolitan Univ. — We present experimental results of elastic constants as a function of temperature and magnetic field for the Pr-based heavy fermion system $PrFe_4P_{12}$, especially in a high-field (HF) ordered phase discovered. Since the HF phase exists in a narrow temperature range below 0.7 K and for high fields above 7 T in a highly limited angular range around the [111] directions, the elastic constants $C_L = (C_{11}+2C_{12}+4C_{44})/3$ and $C_T = (C_{11}-C_{12}+C_{44})/3$ were measured by the longitudinal (L) one propagating along the [111] direction and by the transverse (T) one along the [111] direction polarized to the [1-11] one, respectively. A clear upturn was observed in both of the elastic constants below the HF ordered phase transition temperature. Furthermore, a remarkable elastic softening toward the transition temperature was observed in the temperature dependence of C_L, whereas no softening was observed in C_T. These results indicate that the softening is most likely to be due to the bulk modulus $(C_{11}+2C_{12})/3$. Thus, it is expected that the HF ordered phase seems to be accompanied by a strain fluctuation with Γ_1 spatial symmetry, namely a scalar phase transition with a multi-polar moment is a candidate for the HF ordered phase.

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