

We have studied magnetic properties of the intermetallic NdPd_5Al_2 compound by means of specific heat and magnetization measurements and neutron scattering. The compound crystallizes in the tetragonal $I4/mmm$ space group with lattice parameters $a = 4.147 \text{ \AA}$ and $c = 14.865 \text{ \AA}$, orders antiferromagnetically below $T_N = 1.3 \text{ K}$ and presents large magnetocrystalline anisotropy due to the crystal-field effects. The obtained magnetic phase diagram is characterized by two distinct magnetically ordered phases similarly to structurally related tetragonal RTX_5 and R_2TX_8 compounds. The zero-field antiferromagnetic phase is characterized by the propagation vector $k = (\frac{1}{2}00)$ and antiferromagnetic coupling of Nd moments along the tetragonal c -axis with the amplitude of magnetic moments of $2.22 \mu_B/\text{Nd}$ as was revealed by neutron diffraction. The transition from the paramagnetic to magnetically ordered in zero field is the first-order phase transition. The CF excitations in NdPd_5Al_2 were detected by means of INS at 3.0 meV , 7.4 meV , 8.6 meV and 17.1 meV . We further compare our findings about CF in NdPd_5Al_2 obtained from INS, susceptibility analysis and first-principles calculations and confront them with the experimental magnetization and magnetic specific heat data. Our results will be also discussed with respect to related tetragonal RPd_5Al_2 , R_2TX_8 and RTX_5 compounds.