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Hyperfine field at Mn in the intermetallic compound $LaMnSi_2$ measured by PAC using ^{111}Cd nuclear probe

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Magnetic hyperfine field has been measured in the orthorhombic intermetallic compound $LaMnSi_2$ with PAC spectroscopy using radioactive ^{111}In-^{111}Cd nuclear probe. The sample of $LaMnSi_2$ was prepared by melting pure metallic components in stoichiometric proportion in an arc furnace under argon atmosphere. After melting the sample was sealed in a quartz tube under helium atmosphere, annealed at 1323 K for 60h and then quenched in to water. X-ray analysis showed that the sample has the single phase with the expected crystal structure for $LaMnSi_2$. ^{111}In was introduced in the sample by thermal diffusion at 1323 K for 60h. PAC measurements were carried out with a six BaF_2 detector spectrometer at several temperatures between 50 K and 410 K. The results were analyzed using a model for combined electric quadrupole and magnetic dipole interactions. Comparison of the results with previous studies of PAC in similar compounds shows that ^{111}Cd probes occupy Mn sites. Results show well-defined quadrupole and magnetic interactions at all temperatures. The magnetic hyperfine field (B_{hf}) measured at 50 K is 7.5(1) T. The temperature dependence of B_{hf} follows the normal behavior for host magnetization. The ferromagnetic transition temperature (T_c) was determined to be 402(1) K.

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