Low Temperature Electron Spin Resonance in Dense Intermetallics

V.A. Ivanshin[a], E. Gataullin[a], and A. Sukhanov[b]

[a]MRS Laboratory, Kazan University, 420008 Kazan, Russia
[b]Zavoisky Physical-Tecnical Institute, 420029 Kazan, Russia

One of the most important problems in condensed matter physics involves the microscopic understanding of how localized electrons at high temperatures turn into itinerant heavy quasi-particles in a low temperature metallic state. The fundamental mechanism of this evolution lies at the heart of heavy-electron physics and depends on the Kondo coupling between the conduction electrons (CE) and the localized d or f electrons. Electron spin resonance (ESR) probes microscopically both the local moment (LM) spins and CE in different strongly correlated electron materials such as high-temperature superconductors, pnictides, heavy fermion systems. CE spin resonance (CESR) can be detected in metallic systems based on light elements exhibiting an enhanced Pauli susceptibility. We discuss here the ESR studies in several undoped Yb-, Ce-, and Eu-based intermetallics which share the nature of both, the LM-like and CESR-like ESR signals. The ESR measurements below 25 K in the new ternary phosphides YbRh_6P_4 and CeIr_2P_2 are reported. Different theoretical approaches which were proposed to explain the origin of such unexpected ESR behavior are discussed.