

Two-band superconductivity in MgB₂ controlled by charge doping and band scattering

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The two-band superconductivity in MgB₂ can be controlled only if the role of doping and the intra- and inter- band scatterings is known and understood. In this work doping and the band scatterings are investigated by studying the thermopower and the in-field resistivity of MgB₂ single crystals substituted with C, Al, Li, Mn, C-Li, and Al-Li. Due to these substitutions, MgB₂ is doped with electrons (C, Al), holes (Li), electrons and holes simultaneously and is substituted isovalently with magnetic element (Mn). For these single crystals, the anisotropies of the thermopower and the upper critical field are obtained and analyzed in the frame of simple phenomenological models to better understand the observed features and explain mechanisms being important for the normal-state and superconducting properties. We believe it will help to modify in the controlled way the properties of MgB₂ and thus make this compound, which is one of the cheapest high- T_c superconductor, more suitable for small and large scale applications.