Structure/Properties Relationships in doped MgB_2 Single Crystals

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MgB_2 is a two electronic-bands, two energy gaps superconductor with a high T_c of 39K and unusual properties such as temperature and field dependent anisotropy.

Superconducting hexagonal single crystals of pure and Al, C, Mn and Fe doped MgB_2 phase have been grown at a pressure of 30 kbar using cubic anvil technique [1-2] to study the intrinsic properties of MgB_2. The superconducting transition of doped MgB_2 single crystals can be tuned in a wide temperature range between 10 and 39 K by adjustment of the nominal composition. Al [1], Mn and Fe are substituted on the Mg position of MgB_2 and C [2] on the B position. Introduction of disorder by substitution is partly observed.

In order to elucidate structure/properties relationships we have carried out x-ray single crystal measurements on doped MgB_2 single crystals (the composition varies between 1 and 15 % doping material). Additional temperature dependent measurements on pure MgB_2 and Mn doped MgB_2 has been carried out.

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