Superconducting Property in the Zn Substituted $MgCNi_3$

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We investigated superconducting property of $(Mg_{1-x}Zn_x)CNi_3$ (x=0, 0.03, 0.06, 0.09, 0.12, 0.15, 0.18 and 1) sample where Mg is substituted with Zn. The samples were synthesized using the solid state reaction method under Ar atmosphere. X-ray diffraction spectra show that the $MgCNi_3$ structure is maintained up to x=1 ($ZnCNi_3$). With increasing x, the lattice constant (or the Ni-Ni distance) decreases. Magnetic susceptibility measurement shows that T_c decreases systematically with x and becomes ~2K at x =0.18. Surprisingly, the transition width remains sharp (~0.3K). Under some assumptions, we estimate the coupling constant in the McMillan formula as a function of x which we interpret in terms of the BCS theory.

Keywords : antiperovskite, intermetallic superconductor, BCS coupling constant