Superconductivity in Zr$_2$(Co$_{1-x}$M$_x$) (M = Cu, Ga)$^1$ K.J. SYU, C.H. WU, H.H. WU, S.C. CHEN, H.H. SUNG, W.H. LEE, National Chung Cheng University, W.H. LEE TEAM — As revealed in the powder x-ray diffraction and crystallographic data, the body-centered tetragonal structure of the parent compound Zr$_2$Co is retained in both Zr$_2$(Co$_{1-x}$Cu$_x$) and Zr$_2$(Co$_{1-x}$Ga$_x$) systems with the solubility limit near $x = 0.3$. The refined lattice parameters indicate that there is a movement for $c$ to decrease and $a$ to increase, due to the doping with Cu or Ga in the compound. Since the percentage change in lattice parameters $c$ and $a$ is comparable, a prominent peak in the unit cell volume $v$ versus $x$ curve therefore appears around $x = 0.15$ and $x = 0.2$ for Zr$_2$(Co$_{1-x}$Cu$_x$) and Zr$_2$(Co$_{1-x}$Ga$_x$) systems, respectively. Magnetic and electrical measurements show that there is an explicit maximum $T_c$ close to $x = 0.05$ for both systems. As compared with the Zr$_2$(Co$_{1-x}$Ni$_x$) system$^1$, it may imply that the superconducting transition temperature in Zr$_2$(Co$_{1-x}$Cu$_x$) and Zr$_2$(Co$_{1-x}$Ga$_x$) relate more to the spin density fluctuations than to the density of states at the Fermi level. $^1$M. Takekuni, H. Sugita and S. Wada, Phys. Rev. B 58, 11698 (1998).

$^1$Supported by the National Science Council of Republic of China under grant numbers NSC 99-2112-M-194-006-MY3 and NSC99-2811-M-194-021.

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Date submitted: 17 Nov 2010

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