Crystal Structure of $Fe_{1-x}Sr_2YCu_{2+x}O_{6+\delta}$ Magnetic Superconductor

T. Mochiku[1#], Y. Hata[2], A. Hoshikawa[3], T. Ishigaki[3], H. Yasuoka[2], and K. Hirata[1]

[1]*National Institute for Materials Science, Tsukuba, Ibaraki 305-0047, Japan*
[2]*National Defense Academy, Yokosuka, Kanagawa 239-8686, Japan*
Frontier Research Center for Applied Atomic Sciences, Ibaraki University, Tokai, Ibaraki 319-1106, Japan

 # a corresponding author: E-mail mochiku.takashi@nims.go.jp

$FeSr_2YCu_2O_{6+\delta}$ with a tetragonal $Ba_2YCu_3O_{6+\delta}$-type structure exhibits superconductivity around 60 K when it is properly annealed in a reduced atmosphere and subsequently in an oxidized atmosphere [1]. This compound has atomic order of Cu and Fe along the *c*-axis (see Fig. 1) and superconductivity on a CuO_2 plane competes antiferromagnetic order on a FeO_δ plane. In $Fe_{1-x}Sr_2YCu_{2+x}O_{6+\delta}$ solid solution, whereas substitution of Cu for Fe on the FeO_δ plane prevents antiferromagnetic order, superconducting transition temperature, T_c, decreases with increasing the Cu content, x. Neutron powder diffraction study indicates that the oxygen content, 6+δ decreases with increasing x. The decrease of 6+δ causes the decrease of carrier concentration on the CuO_2 plane, and resultantly T_c decreases. Mössbauer spectroscopy study revealed that the Fe ion has predominantly 5-fold oxygen coordination [2]. There is a possibility that the change of 6+δ is caused by the absorption and desorption of oxygen at the oxygen site around the Cu ion rather than the Fe ion on the FeO_δ plane.

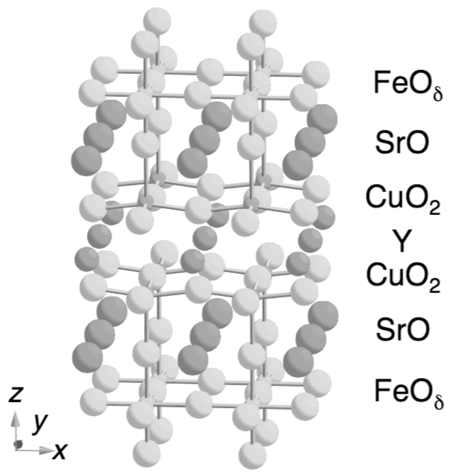

Fig. 1. Crystal structure of $FeSr_2YCu_2O_{6+\delta}$.

References
[1] T. Mochiku, *et al.*, J. Phys. Soc. Jpn. **71**, 790 (2002).
[2] Y. Hata *et al.*, Physica C **417**, 17 (2004).