

XPS study of high- T_c superconductors

Masayasu Nagoshi

Kokan Keisoku K.K.

1-1 Minamiwatarida, Kawasaki 210, Japan

A carrier concentration in the Cu-O₂ planes is a key parameter to achieve the optimum property of high- T_c superconductors and has been controlled by changing atomic concentrations. However, to estimate *real* carrier concentrations from atomic concentrations obtained by chemical analysis or electron probe microanalysis (EPMA) often fails. The reason is that the high- T_c cuprates usually have complex charge distributions in crystal structures due to peculiar layered structures (a stack of alternate the blocking layer and the Cu-O₂ plane) and multi-valent ions in the blocking layers. X-ray photoelectron spectroscopy (XPS) is one of the most powerful tools for probing *atomically* - local electronic structures. We have found that the binding energies of Ba, Sr, Ca, and Y core-levels can be a measure of *real* hole concentrations in the Cu-O₂ planes. [1] On the other hand, core levels of metallic ions in the blocking layers, such as Tl 4f and Pb 4f, have provided important information about valence states of the blocking layers.[2] In this paper, changes of the charge distributions in the crystal structures caused by controlling oxygen contents and by atomic substitutions are discussed from the core-level spectra for the Bi-Sr-Ca(Y)-Cu-O superconductors.

[1] M.Nagoshi, Y.Syono, M.Tachiki, and Y.Fukuda, Phys.Rev.B 51, 9352 (1995).

[2] E.Oshima, M.Kikuchi, M.Nagoshi, Y.Fukuda, and Y.Syono, Physica C 250, 320 (1995).

TEL +81-44-355-7430 FAX +81-44-355-7499