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Important issues from uncontrolled cation nonstoichiometry in well-known cuprates JUN-ICHI SHIMOYAMA, HIRAKU OGINO, SHIGERU HORII, YUHYA YAMAZAKI, KOICHI KAKU, YUI ISHII, KOHJI KISHIO, University of Tokyo — Our recent studies revealed that the post-annealing to control cation composition largely changes superconducting properties of cuprate superconductors, such as Bi-based compounds and the RE123 system. For example, the T_c of Bi(Pb)2223 was enhanced up to 118 K by post-annealing at ∼950 K in air, while it was a typical value of 110 K before post-annealing. Strong correlation between the c-axis length and T_c suggested that cation composition plays a crucial role to determine superconducting properties of this compound. On the other hand, substitution of RE for Ba-site in RE123 has been well recognized for light-RE123. However, such RE-rich RE123 compounds were found to form even for heavy-RE123 including Y123, which has been considered as a compound free from cation nonstoichiometry. The Y-rich Y123 exhibited suppressed T_c down to ∼80 K and apparently short c-axis length. These result indicated that intrinsic physical properties of layered cuprates should be reexamined after careful control of cation stoichiometry besides control of oxygen composition, because nonstoichiometric cation composition and its local fluctuation strongly affect electronic and vortex systems and related flux pinning properties.

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