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工学研究科修士論文

02-HIPping Effects on  
Superconducting Oxide in  
Y-Ba-Cu-O System

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O<sub>2</sub>-HIPING EFFECTS ON SUPERCONDUCTING OXIDE IN Y-Ba-Cu-O SYSTEM

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In the present work, two kinds of studies were carried out to determine the effects of Oxygen-Hot-Isostatic-Process ( $O_2$ -HIP) on the Y-Ba-Cu-O system. At the first, stability of the Y-Ba-Cu-O system has been studied for different total-gas-pressures ( $P_{tot}$ ), oxygen-partial-pressures ( $P_{O_2}$ ) and temperatures by using  $O_2$ -HIP method.  $P_{tot}$  vs. temperature phase diagram at constant  $P_{O_2}$  (10MPa), and  $P_{O_2}$  vs. temperature phase diagram at constant  $P_{tot}$  (200MPa) were obtained. The dependence of the phase-transformation-temperature of the Y-Ba-Cu-O system on  $P_{tot}$  and  $P_{O_2}$  was examined. The phase stability analysis reveals for the first time that the transformation-temperature from  $YBa_2Cu_4O_8$  (124 phase) to  $Y_2Ba_4Cu_7O_{15}$  (123.5 phase) with CuO at 10MPa of  $P_{O_2}$  increases as  $P_{tot}$  rises, phase-transformation-temperature from 124 phase to 123.5 phase with CuO and from  $YBa_2Cu_3O_7$  (123 phase) with CuO to 123.5 phase with CuO at 200MPa of  $P_{tot}$  increases as  $P_{O_2}$  rises, and 123 phase with CuO transforms to 124 phase at 7MPa of  $P_{O_2}$  for the temperature range 1170-1370K at 200MPa of  $P_{tot}$ .

The second work is to determine the  $O_2$ -HIPping effects on AgO doped Y-Ba-Cu-O system. A  $YBa_2Cu_{4-x}Ag_xO_8$  superconductor ( $0 < x < 4$ ) was successfully synthesized using  $O_2$ -HIP method. For the first time Cu atoms of conduction plane were partially replaced by other metallic atoms. Most of the mixed Ag atoms could substitute Cu atoms in the range of  $x < 0.8$ . The lattice constants  $a$  and  $c$  decrease and  $b$  increases in the range of  $x > 0.4$ . The critical-temperature increased about 3K by a Ag doping fraction of  $x = 0.4$ . Cu atoms could not substitute Ag atoms beyond  $x = 4$ .

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