## WBP8-7

# Effect of extra addition of Ba into $YBa_2Cu_3O_{7-\delta}$ coated conductor with $BaHfO_3$

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Critical current density ($J_c$) of $YBa_2Cu_3O_{7-\delta}$ (YBCO) film in magnetic fields can be enhanced by introducing $BaHfO_3$ (BHO) flux pinning centers into the film [1]. In order to increase $J_c$, the YBCO films are fabricated by a metal organic deposition method using chemical solution with Ba deficient composition [2]. In this case, about 1 μm sized CuO precipitates were formed on the film surface due to the Ba deficient in our previous study [3]. In this study, we added extra Ba into the starting solution to compensate the shortage of Ba and investigated the influences of this Ba addition on the surface morphology.

Starting solution contains elements of Y, Ba, and Cu with molar ratio of 1 : 1.5 : 3. Two types of solution were prepared using the starting solution; one is added Hf of 10 mol% (indexed as Hf10), and another one is added both Hf and Ba of 10 mol% (indexed as Hf10-Ba10). These two solutions were spin-coated onto $CeO_2$/$LaMnO_3$/MgO/$Gd_2Zr_2O_7$/Hastelloy substrates separately, then the coated films were calcined to prepare precursor films at 430 °C in $O_2$ gas flow. Finally, the precursor films were crystallized to prepare YBCO at 780 °C in mixed gas flow of Ar and $O_2$. Surface morphology and elemental mapping of the samples were observed by a scanning electron microscopy (SEM) and an energy dispersive X-ray spectroscopy (EDS).

Fig. 1 shows SEM images and EDS elemental distribution maps of Cu and O for the samples prepared from each solution. CuO precipitates were observed on the sample surface in both films, whose sizes were almost the same. Table 1 shows the comparison of number density of CuO precipitates seen in Fig. 1 for each sample. CuO precipitates of Hf10-Ba10 decreased by about 60% compared to Hf10. It is suggested that extra addition of Ba is effective to suppress the formation of CuO.

[1] S. Engel et al Appl. Phys. Lett. 90 (2007) 102505
[2] K. Nakaoka et al Physica C 463 (2007) 519-522
[3] S. Yamada et al ISMMM Program Book (2018) 44

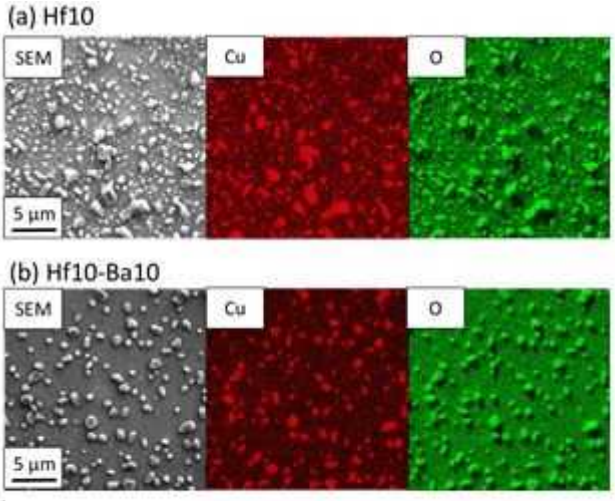


Table 1 Comparison of number density

| | Number density ($cm^{-2}$) |
|---|---|
| (a) Hf10 | $1.75 \times 10^6$ |
| (b) Hf10-Ba10 | $6.77 \times 10^5$ |

Fig. 1 SEM images and EDS mappings of sample surface.

Keywords: YBa2Cu3O7-δ , BaHfO3, Flux pinning center, Extra addition of Ba