

# Preparation and Characterizations of shocked Bi-surperconducting crystal grains by annealing effects

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## 1. Introduction

The surperconducting Bi-Pb-Sr-Ca-Cu-O(BPSCCO)<sup>(1)-(6)</sup> was fabricated by use of the shock compaction method, employing a propellant gun-system, and then sintered using an electronic furnace. The specimen as a magnetic sensor was maintained in the superconducting state at 77.4K, under a current density of approximately 40 A/cm<sup>2</sup> in the absence of an excitation magnetic field. The superconducting state was then broken and the specimen exposed to a value of  $40 \times 10^{-4}$  T. That is, the resistance of the specimen occurred when exposed to  $40 \times 10^{-4}$  T under a constant J of 40 A/cm<sup>2</sup>.

In the present study, Starting material (Bi<sub>1.85</sub>-Pb<sub>0.35</sub>-Sr<sub>1.90</sub>-Ca<sub>2.05</sub>-Cu<sub>3.05</sub>-O<sub>x</sub>) added the crystal nucleus of 5% or 10% are used for the promotion of crystal grain. It aims at the promotion of the superconductor crystal grain with 2223-phase and 2212-phase by the compact compression technology and the establishment of the optimization of the experimental condition.

## 2. Experimental

To enlarge the crystal grain, the seeds is made to exist together by 10% and 5%. The crystallization is done by compressing the impact by the very high pressure of about 10GPa, melting surface of the pandiction, and solidifying by using the effect of putting on pressure on a surface each other. Afterwards, the anneal processing is given for 48 hours at 840C<sup>o</sup>, and making for the distribution of the crystal is promoted.

Fig.1 shows the diagrammatic illustration of the device for the shock compaction..

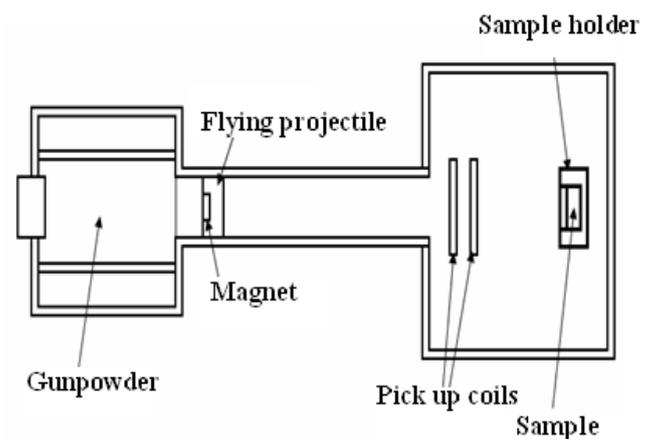


Fig.1 The shock compaction system

The size of the shape of the crystal grain are observed with SEM, and crystal structures are analyzed by X-ray diffraction.

## 3. Results and discussion

The observational result are shown in Fig. 2. In the case of 5%-content. The average size of 2.0 $\mu$ m and the maximum size of 3.1 $\mu$ m are observed by SEM without annealing. The average size of 2.9 $\mu$ m and the maximum size of 4.8 $\mu$ m are observed by SEM with annealing. In the case of 10%-content. The average size of 11.6 $\mu$ m and the maximum size of 14.2 $\mu$ m are observed by SEM without annealing. The average size of 2.9 $\mu$ m and the maximum size of 4.8 $\mu$ m are observed by SEM with annealing.

The grain growth difference of about 20 $\mu$ m or more according to giving the anneal processing was caused to the annealing effects. small amount of growth difference before processing the anneal was caused. Fig. 2 shows the size of crystal grain SEM-image with 10%-content of seeds. Some peaks of 2223-phase aspects

were observed to the sample including 5%-content of seeds. The more peaks were observed to the sample including seeds 10%. Table3 shows X-ray diffraction result comparison with 5%-content of seeds and 10%-content of seeds.

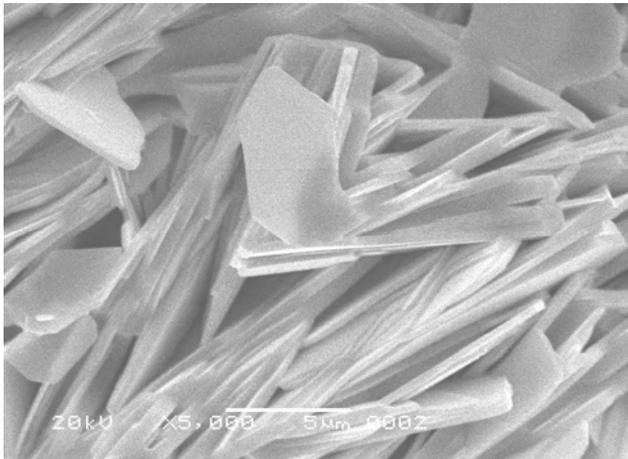


Fig. 2. The measurement of the size of crystal grain using SEM-image with 10%-content of seeds.

Table1. X-ray diffraction result with 5%-content of seeds.

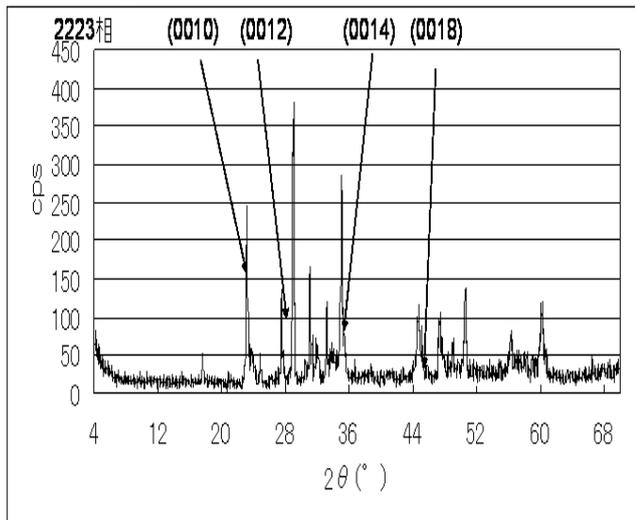


Table2. X-ray diffraction result with 10%-content of seeds.

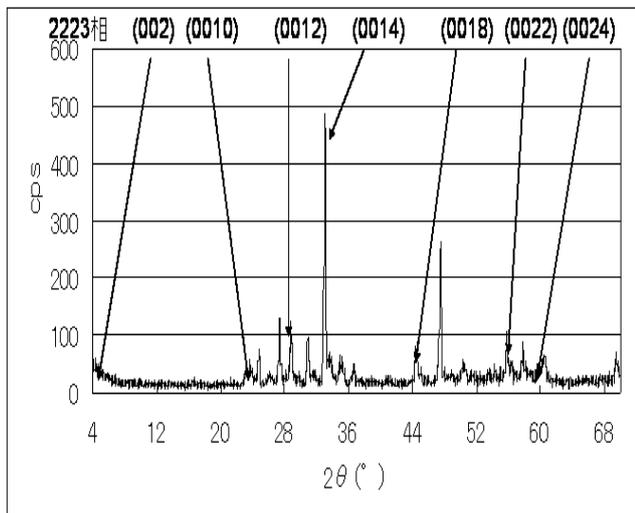


Table3. X-ray diffraction result comparison with 5%-content of seeds and 10%-content of seeds.

content of 10%	Content of 5%
(hkl)	(hkl)
(002)	
(0010)	(0010)
(0012)	(0012)
(0014)	(0014)
(0018)	(0018)
(0022)	
(0024)	

#### 4. Conclusions

In the case of 5%-content, the average size of 2.0 $\mu$ m and the maximum size of 3.1 $\mu$ m are observed by SEM without annealing. The average size of 2.9 $\mu$ m and the maximum size of 4.8 $\mu$ m are observed by SEM with annealing. In the case of 10%-content, the average size of 11.6 $\mu$ m and the maximum size of 14.2 $\mu$ m are observed by SEM without annealing. The average size of 2.9 $\mu$ m and the maximum size of 4.8 $\mu$ m are observed by SEM with annealing. Some peaks of 2223-phase aspects were observed to the sample including 5%-content of seeds. The more peaks were observed to the sample including seeds 10%. X-ray diffraction result comparison with 5%-content of seeds and 10%-content of seeds.

#### References

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