

## Development of the sintering technique by the plasma heating

### プラズマ加熱による焼結手法の開発

Toru Murakami Kazumasa Yamamoto Nobuhiro Nisino

村上 徹 山本 一誠 西野 信博

Hiroshima University graduate school engineering graduate course

#### 1. Introduction

Now, there is various sintering technique, but the substituted gas in the quartz tube with the sample becomes the plasma state by this experiment, and sample is heated it. There is a limit in the shape of the molding body to heat while compressing monaxon by the SPS method which is the plasma sintering technique that has been already established.

In plasma sintering to perform by this experiment, the thing for all shapes of the sample is an advantage to heat a sample after the molding if it is the size that a sample is in the quartz tube.

#### 2. Experiment method

At first, the sample to use for an experiment filled jig with powder and pushed it with monaxon compression using a 5t press machine in 400MPa. Next, the sample which I installed in the Cavity part of the single mode microwave equipment horizontally is installed in a quartz tube. And I heated by the plasma which occurred by exposing a microwave after having put He gas after having made quartz jurisdiction a vacuum until it became the pressure of 1kPa.



Fig.1. Single mode microwave heating arrangement

#### 3. The result of study

I performed 5-minute plasma heating in a sample of the Fe. The sample which was 78.0% of relative density before heating rose to 83.9% of relative density after heating. The temperature of the sample increased to approximately around 1,100 degrees then.

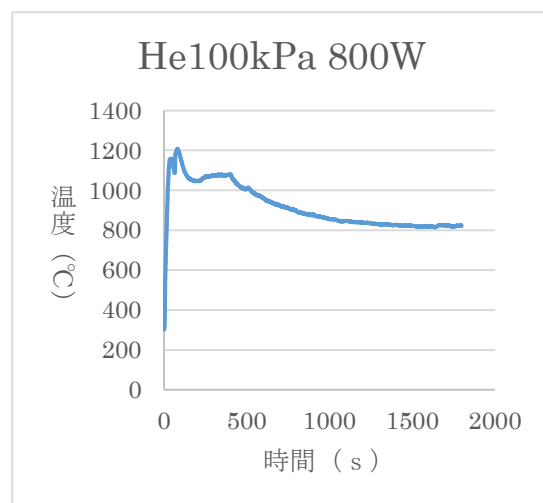


Fig.2. Temperature change when I heated a Fe sample

I will think that I can raise relative density by finding the most suitable temperature and heating time in future.

sintering body quantitatively in future.

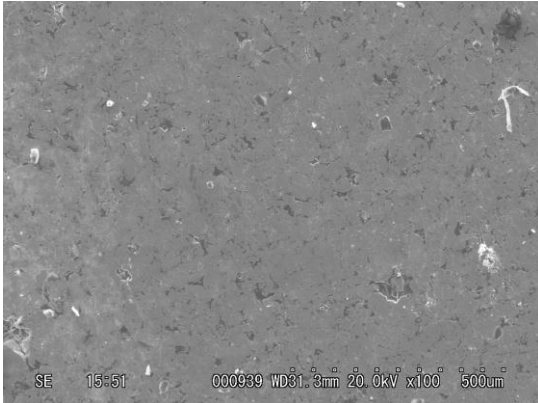


Fig.3. Organizational chart before letting Fe sinter

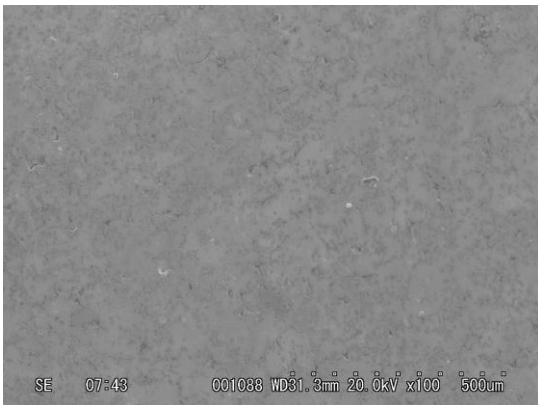


Fig.4. Organizational chart after having let Fe sinter

When I compare the upper figure, I understand that sintering advances, because Fig4 is that a pore decreases when I compare Fig4 with Fig3.

The hardness examinations are not done now because a sample is small, but I want to measure the properties of matter of the