Translation

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To Whom It May Concern:

Company Name: MEC COMPANY LTD.
Representative: CEO & President Kazuo MAEDA
(Securities code: 4971)
Contact: Corporate Communication Office Head
Yoshihiro SAKAMOTO
(TEL +81-(0)6-6401-8160)

Development of 3D Printing Technology Using Unalloyed Copper Powder

We have developed 3D printing technology for unalloyed copper that can be modeled with a general-purpose-output fiber laser, which is widely installed in commercially available metal 3D printers. We achieved this in joint research with the Osaka Research Institute of Industrial Science and Technology (a local incorporated administrative agency) (patent no. 6721934).

1. Background to development

3D printing technology is also called metal additive manufacturing technology, and it makes it possible to quickly manufacture products with complex shapes that cannot be molded with conventional processing methods. It can reduce the weight of products and additionally give them various functions.

In recent years, 3D printing technology has been put to practical use with steel, aluminum, titanium, and other materials. With copper, on the other hand, although such technology has been put to practical use with some copper alloys, it has not with pure copper. Pure copper holds promise due to its excellent electrical and thermal conductivity. The main reason for this is that general pure copper powder strongly reflects the fiber laser that is widely installed in commercially available metal 3D printers. Therefore, it has been difficult to melt pure copper powder with the output of a commonly used laser to obtain a high-density model.

By utilizing the technology for treating copper surfaces that we cultivated in our electronic substrate business, we have developed a unalloyed copper powder that contains no metals other than copper and has a high energy absorption rate.

2. Overview of business

We have confirmed that a molded product made with this technology has high density and high conductivity compared to a conventional molded product made of general pure copper powder.

Going forward, we will consider having this technology used by manufacturers by providing them with a patent license.

We will contribute to technological innovation in various industries centered on the fields of aerospace and industrial machinery. We will do this by utilizing the excellent electrical conductivity and thermal conductivity of unalloyed copper along with 3D printing technology for small-lot production of various types of products with complex shapes.

3. Future outlook

At the moment, we believe that the impact of this development on our business forecasts for the current consolidated fiscal year will be minor. However, we will promptly disclose any necessary corrections or matters to be announced in the future.

Translation

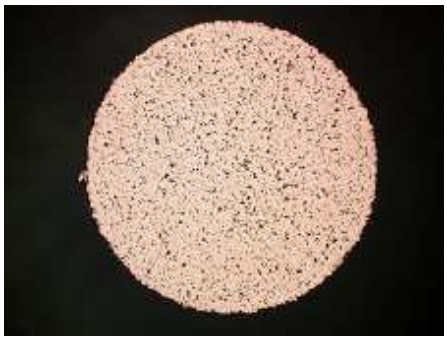
(Reference)

Photo 1: Appearance of powder

Conventional product

Developed product

Photo 2: Cross section of a cylindrical model (diameter 8 mm × height 10 mm)



Conventional product

Developed product