

Copper Printing

Exploring capabilities and applications of copper printing

BACKGROUND

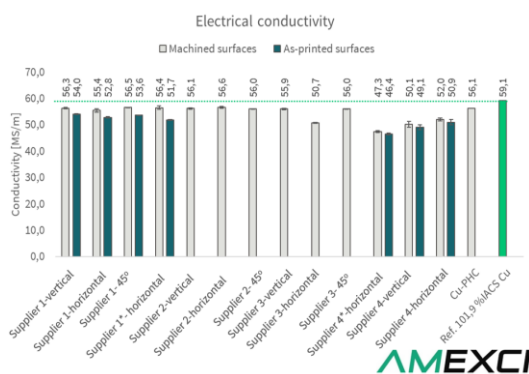
Copper and copper alloys are used in variety of applications especially as heat exchangers, heat pipes, induction coils and electrical contacts. Traditional manufacturing methods which usually require several steps presents a challenge when the complexity of the components increases with the goal of enhancing thermal and electrical performance. In this context, additive manufacturing (AM) provides an excellent solution while shortening the lead times and minimizing the production steps.

SCOPE

In 2019, AMEXCI conducted a pre-study about copper printing aiming at evaluation of copper printing technology trends, maturity of manufacturers and technologies, material properties as well as main challenges regarding the design. Copper printing has mostly been developed for Laser Powder Bed Fusion (L-PBF), with several companies providing both commercially pure copper and low alloyed copper. However, the main challenge of manufacturing pure copper with L-PBF is the low laser absorption of copper with the infrared lasers. Other than L-BPF, companies excelled within Electron Beam Powder Bed Fusion (EB-PBF), Direct Energy Deposition (DED) and Cold Spray have also developed processes for copper printing.

INSIGHTS

Following the know-how attained throughout the pre-study, AMEXCI's goal was to broaden the scope from research on copper printing to application of additively manufactured copper parts by an extended project in 2020. Accordingly, to acquire excellent electrical and/or thermal properties, the benchmark specimens were designed targeting at investigations of different properties to be achieved and to be tested to evaluate various AM copper materials, technologies, and suppliers.



Implementation of such functional designs to the copper printing project opened the possibility to measure the electrical conductivity, thermal conductivity, dimensionality, metallography, and microstructure of benchmark samples printed by three main manufacturers of copper AM, e.g., EOS Copper Cu CP (99,95% pure copper) as built, Trumpf commercial pure copper after blasting, and Markforged MetalX as sintered.

The attained outcomes of this study along with analyses of performed measurements have not only broaden AMEXCI's knowledge on copper printing, but also opened a discussion space for eventual applications of copper AM.

AMEXCI AB, Gammelbackavägen 2, 691 51 Karlskoga, Sweden | www.amexci.com

CONTACT

Manja Franke
Head of Research

manja.franke@amexci.com

+46 72 241 1004

The full version is available for participants of this project within AMEXCI's shareholder companies.