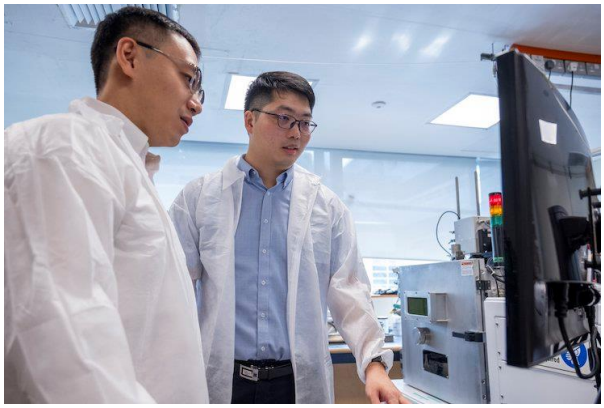
Stampare in 3D (Italy)
31 Oct 2023

English translation

A revolutionary methodology for the production of 3D printed metals with different properties such as areas that are more resistant to corrosion than others in the same metal



3D Printed Metals: An Innovative Technique for Contrasting Properties

Researchers from Nanyang Technological University Singapore (NTU Singapore) and the University of Cambridge have developed a revolutionary methodology for producing 3D printed metals with contrasting properties. This technique employs 3D printing steps to create custom metal components with various characteristics, such as the presence of stronger metal regions than others or different levels of corrosion resistance within the same metal.

The research team, led by Professor Gao Huajian of NTU Singapore and Assistant Professor Matteo Seita of the University of Cambridge, drew inspiration from the principles of 'heating and beating' processes to develop this innovative process. Their research combined knowledge from materials science and mechanical engineering, before applying 3D printing techniques to deliberately alter the microscopic structures of metals, thereby modifying their properties. This method allows manufacturers to define the desired internal microstructure for the metal, precisely determining its position within the material.

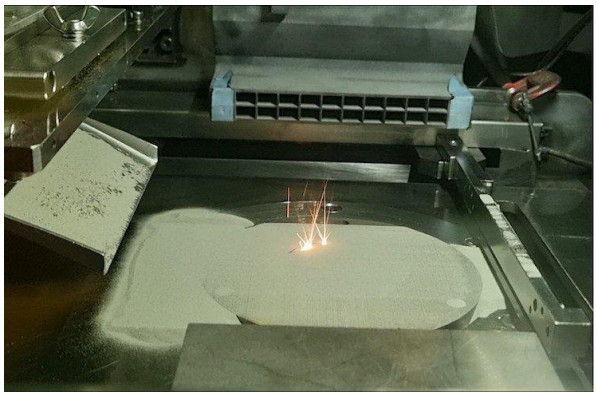
Unlike traditional techniques involving heating and beating 3D printed metals, research has focused on modifying internal microstructures without the use of beating, which could inadvertently damage the internal structure of the material. Dr. Gao Shubo, first author of the study published in Nature Communications in October 2023, found that the metal's microstructures can be rearranged through a process of rapid expansion and contraction during heating and cooling during 3D printing. This manipulation can be achieved by adjusting the power source of a 3D printer, demonstrating that laser variation can affect the type of microstructure that forms in the metal after heating. In other words, it is possible to obtain a structure that gives the metal greater strength, and another that

makes it mechanically weaker. The printed layers were also melted to facilitate these changes in the metal's microstructures.

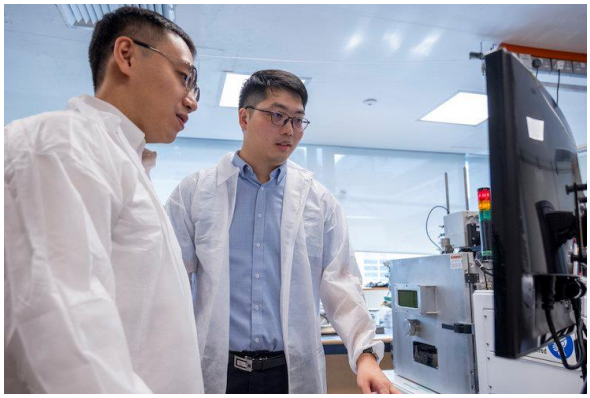
Researchers believe that the synergistic interaction between strong and weak metal regions in stamped metal offers the potential to create more robust and resistant materials, while simultaneously enabling the production of metals with different functional properties.

Professor Gao Huajian said, "Our method opens up new perspectives in the design of high-performance metal components with customizable microstructures, allowing the mechanical and functional properties of parts to be adjusted, even at specific points, and allowing them to be modeled in a complex way through 3D printing."

Dr Gao Shubo added: "Our strategy is able to target specific sites within the metal, allowing manufacturers to design and create complex microstructures to customise the properties of the metal in ways never seen before. In other words, the same metal can exhibit contrasting properties within the same component."



One of the powder bed laser melting machines used in experiments by NTU Singapore and the University of Cambridge to 3D print metals with different properties.



Dr. Gao Shubo (left) and Dr. Li Zhi (right) use a powder bed laser fusion to print components for their research.

https://stamparein3d.it/una-metodologia-rivoluzionaria-per-la-produzione-di-metalli-stampati-in-3d-con-proprieta-diverse-come-aree-piu-resistenti-alla-corrosione-rispetto-ad-altre-nello-stesso-metallo/