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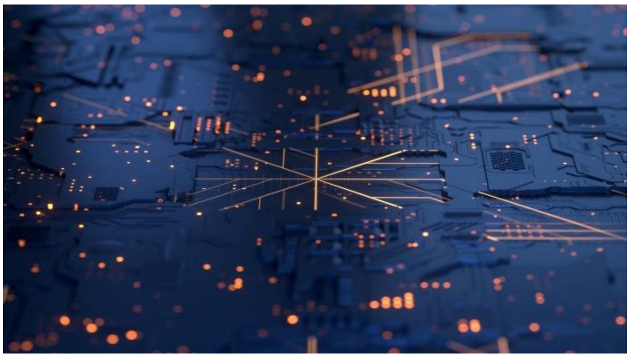
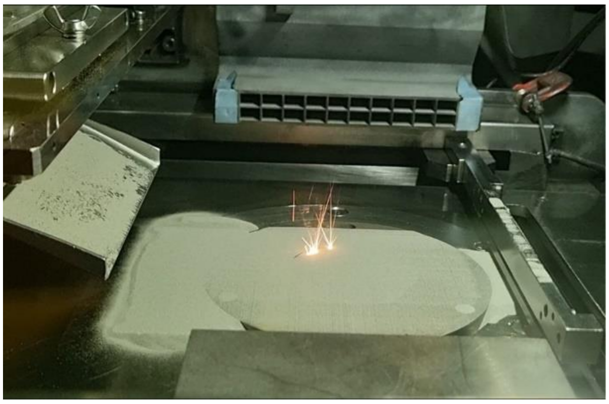
Singapore: Revolutionising Metal 3D Printing



Yen Ocampo

A groundbreaking development in the field of 3D printing has emerged, offering the potential for 3D-printed metal components with distinct and contrasting properties is spearheaded by Nanyang Technological University, Singapore (NTU Singapore) and the University of Cambridge, promises to reshape the manufacturing landscape by eliminating the need for additional raw materials, mechanical treatments, or complex machining processes.



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Instead, this new method leverages the principles of materials science and mechanical engineering, in tandem with 3D printing techniques, to alter the microscopic structures of metals, thus modifying their properties.

Traditionally, the concept of altering metal properties often conjures images of blacksmiths hammering and reshaping metals to enhance their strength. However, this age-old method isn't suited for complex 3D-printed structures. Dr Gao Shubo, a research fellow at NTU's School of

Mechanical and Aerospace Engineering, embarked on a journey to find an innovative way to adjust the microstructures of 3D-printed metals without resorting to traditional "beating."

Dr Gao's solution lies in harnessing the unique capabilities of 3D printing. By adjusting the energy source, typically a laser beam, during the printing process, it became possible to melt layers of metal powder in specific ways.

This controlled the formation of gaps in the metal, but the real breakthrough lay in how this affected the metal's microstructures. The researchers found that by altering the laser parameters, they could create distinct microstructures within the same metal part, some of which enhanced its strength while others made it mechanically weaker.

What sets this method apart is the ability to fine-tune the characteristics of each 3D-printed metal at different points within the structure. This level of precision is unattainable with conventional manufacturing processes, offering manufacturers the exciting prospect of designing intricate components with tailored properties. For instance, a single metal part can exhibit contrasting properties in different regions, catering to a wide range of applications.

Remarkably, the research team discovered that 3D-printed metals with both strong and weak regions displayed a synergistic interaction, resulting in slightly greater strength than metals with uniformly strong regions. This revelation has the potential to challenge conventional wisdom, potentially leading to the creation of stronger and tougher materials that defy classical theories governing composite materials.

Additionally, the researchers believe that this method can be applied to produce 3D-printed metals with varying functional properties. For instance, a metal component could be designed to exhibit increased corrosion resistance in submerged sections while being less corrosion-resistant in parts exposed to the atmosphere. The possibilities appear limitless, and future endeavours may involve exploring new microstructure designs that further enhance mechanical and functional properties.

This groundbreaking approach marks a significant milestone in the realm of 3D printing. Not only does it open doors to a new era of manufacturing efficiency by reducing costs and simplifying the production process, but it also ushers in a wave of customisation previously unattainable in the world of metals.

The ability to fine-tune a metal's properties at a microscopic level will undoubtedly lead to innovative and groundbreaking applications across various industries. As technology continues to advance, the future of 3D-printed metals appears to be filled with endless opportunities for creativity and innovation.

The two universities believe that 3D printing may serve as a bridge between the digital and physical worlds and that its integration into the digital economy is changing how things are developed, manufactured, and consumed. It mirrors the digital economy's broader shift toward more nimble, personalised, and data-driven techniques.

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