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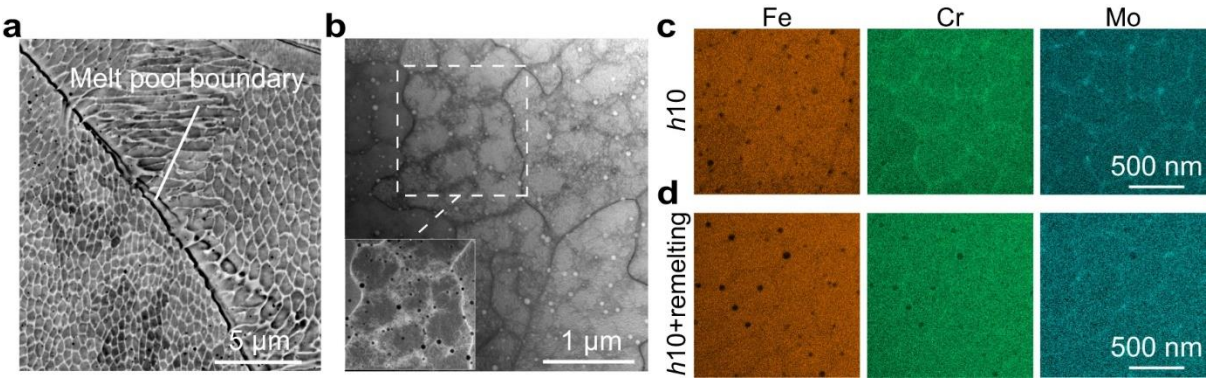
Researchers Customize 3D Printed Metal Properties Using Novel Method

Researchers at NTU Singapore and the University of Cambridge have co-developed a 3D printing method that produces metal parts with varying properties. Specifically, it allows certain regions of the metal to be stronger than others.

This technique distinguishes itself by negating the need for supplementary raw materials, additional mechanical treatments, or intense machining processes, thus offering potential cost savings in manufacturing. The process permits not only strength variance but also customization of other features, such as electrical conductivity and corrosion resistance levels within the same metal component.



(a) Scanning electron micrograph of chemically etched SS316L (b) Scanning transmission electron microscopy (STEM) analysis of the internal structure of cell boundaries (c & d) Energy disperse spectroscopy (EDS) STEM measurements comparing solute distribution between two h10 samples. (Image Credit: NTU Singapore)

The inspiration for this method comes from traditional blacksmithing approaches. By integrating materials science with mechanical engineering principles, the researchers leveraged 3D printing techniques, typically used to mitigate defects in printed metals, to modify their microscopic structures. This approach provides precise control over the metal's internal microstructure, enhancing the properties at specific points.

Prof. Gao, from NTU's Mechanical and Aerospace Engineering department, highlighted the potential this method offers for designing intricate metal parts with tunable microstructures.

The method's potential extends to crafting metals with functional variations. For instance, a part can be designed to display enhanced corrosion resistance when submerged, while retaining standard properties elsewhere. Future exploration may delve into new microstructure designs, enhancing both mechanical and functional properties of metals.

The detailed process is documented in a recent publication titled "*Additive manufacturing of alloys with programmable microstructure and properties*" in Nature Communications, which you can read at this link.

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