

## Highlight

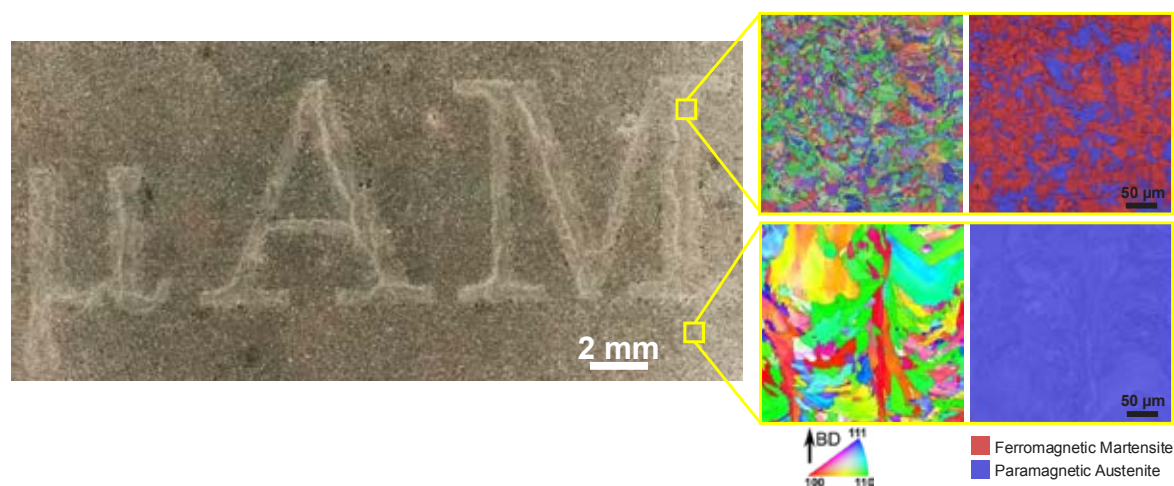
# Site-specific phase control in additive manufacturing of stainless steel 17-4 PH offering tailored local magnetic properties

MicroAM focuses on design of materials with architected microstructures by additive manufacturing. This allows for the customization and optimization of final metal components' performance by combining properties derived from dissimilar microstructures, such as enhanced mechanical or functional characteristics.

DTU has built a fully open-architecture LPBF system with an open controller, which enables a point-by-point control of laser-matter interaction and perhaps more importantly the ability to study and analyze scientifically the link between set process parameters and *actual* machine conditions. For further reading please see the article from AM Media referred to below.

In this work, the as-built microstructure of 17-4 PH stainless steel is in-situ tailored between paramagnetic austenite and ferromagnetic martensite by adjusting the laser energy density. This capability is attributed to variations in solidification behavior at different energy densities. The approach offers precise control over the material's magnetic properties at specific locations. Additionally, it highlights the potential of in-situ microstructural engineering by dynamically tuning the thermal pathways during the LPBF process, offering a versatile strategy to tailor properties - in this case magnetic properties - to meet diverse application requirements.

LPBF-produced 17-4 PH part with ferromagnetic "μAM" embedded in the paramagnetic matrix. Left: "μAM" text revealed by etching. Right: detailed microstructure of the ferromagnetic and paramagnetic regions.



For further information, please see:

[https://www.additivemanufacturing.media/articles/the-downloadable-metal-3d-printer?utm\\_source=linkedin&utm\\_medium=zelinski&utm\\_campaign=comment](https://www.additivemanufacturing.media/articles/the-downloadable-metal-3d-printer?utm_source=linkedin&utm_medium=zelinski&utm_campaign=comment)