

# Crack Mitigation Strategies for a High Strength Al Alloy Al92Ti2Fe2Co2Ni2 Fabricated by Additive Manufacturing

**Compliant LPBF scaffolding relieves residual stress to print fully dense, crack-free high-strength aluminum parts.**

Researchers at Purdue University have developed a crack mitigation strategy for aluminum (Al) alloys made using additive manufacturing. Traditionally, methods to mitigate cracking in these materials require modifying the chemistry (alloying or particle inoculation) or through extensive heating of the build plate beyond the capability of most laser powder bed fusing systems. Purdue's approach utilizes a scaffolding support structure to alleviate residual stresses in the material as the part is fabricated. This system can be applied to a variety of alloys without requiring changes to the alloy chemistry. Applications of this technology include additive manufacturing of high-strength aluminum alloys to create fully dense, crack-free parts.

## Advantages

- Fabrication of fully dense, crack free Al-alloy parts
- Compatible with conventional laser powder bed fusing systems

## Applications

- Additive manufacturing
- Aluminum alloys
- Rapid prototyping / bespoke part fabrication

## Technology Validation:

This technology has been validated through fabrication and testing of Al alloy specimens made using this technology. Results showed that a compliant scaffolding structure successfully eliminated crack formation

## Technology ID

2024-ZHAN-70392

## Category

Materials Science &  
Nanotechnology/Advanced  
Functional Materials  
Chemicals & Advanced  
Materials/Materials Processing &  
Manufacturing Technologies

## Authors

Anyu Shang  
Benjamin Thomas Stegman  
Haiyan Wang  
Xinghang Zhang

## Further information

Parag Vasekar  
[psvasekar@prf.org](mailto:psvasekar@prf.org)

## View online



during production. This was validated using micro-CT analysis.

Related Publication: <https://doi.org/10.1016/j.jmrt.2024.04.191>

**TRL:** 6

**Intellectual Property:**

Provisional-Gov. Funding, 2023-12-20, United States

Utility-Gov. Funding, 2024-12-19, United States

**Keywords:** 3D Printing, Additive Manufacturing, alloy, Aluminum, crack mitigation, crack propagation, Materials and Manufacturing, Materials Science, Mechanical Engineering, Nanomaterials