

# Simulating effects of alloy additives on solidification

## Motivation:

Additive Manufacturing (AM) allows the production of parts with complex geometries that are unattainable with conventional manufacturing processes. Laser powder bed fusion (LPBF) in particular, is very relevant for constructing strong, lightweight metal parts. However, standard metals for lightweight applications, such as aluminum (Al), are only printable in a certain processing window and thus not well suited for these applications.

Next to process design, material design is a key factor in overcoming this issue. Microalloying Al with other metals, such as titanium (Ti) and zirconium (Zr), can influence the microstructures developing during the solidification, making the alloy usable for LPBF.

## Goal:

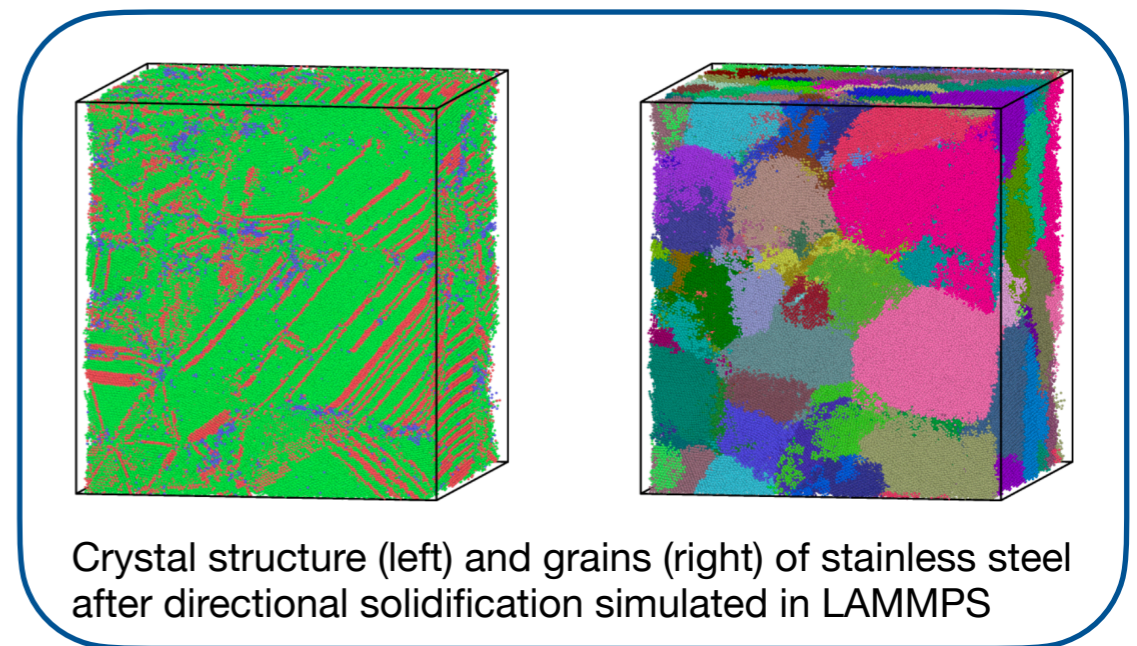
This Thesis aims to analyze the influence of adding different metals to aluminum in varying quantities on the resulting crystal structures and material properties after solidification.

## Tasks:

- Familiarize yourself with molecular dynamics simulation
- Familiarize yourself with the solidification of metals
- Simulate solidification of different alloys in LAMMPS
- Evaluate the mechanical properties of the solidified alloys
- Understand the impact of additives on the solidification process

## Requirements:

- Interest in additive manufacturing of metals
- Experience with molecular dynamics is advantageous
- Highly motivated



If you are interested in this project or have further questions, please write a mail to [ian.stoermer@tum.de](mailto:ian.stoermer@tum.de).