

Student Theses

Atomistic simulation

To understand materials and develop new alloys, atomistic methods have been established in the last 20 years that can simulate the behavior of single atoms or even the bonding of electrons.

At the Institute for Materials Science, these methods are used to develop and optimize alloys.

The top figure shows the electronic bonds in a phase of nickel and niobium. Bonds between nickel and niobium are stronger than those between nickel and nickel.

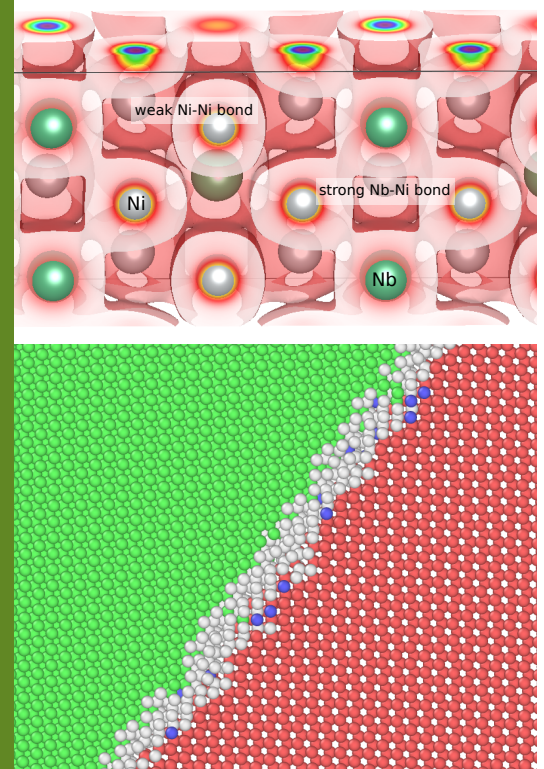
The bottom figure shows the interface configuration between pure nickel (left) and the δ -phase Ni_3Nb (right). Atoms are colored according to their lattice structure. At the interface the structure is disordered, increasing the interface energy.

Requirements for these projects

Willingness to learn a complex topic

Interest to work with complex programs

Knowledge in python and basic Linux knowledge



Finite element simulation of 3D printing

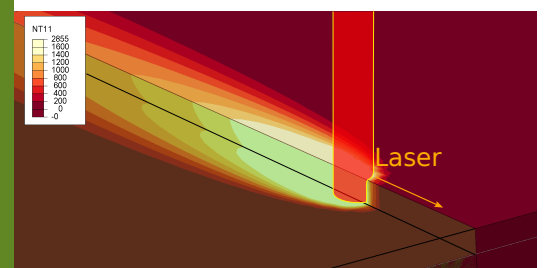
Developing alloys and optimizing processes for additive manufacturing (“3D printing”) is an important research topic at the Institute for Materials Science. Finite element simulations can help to understand the process conditions and to predict temperatures and stresses during the process.

The figure shows a cross section of the calculated temperature field during 3D printing of a titanium alloy.

Requirements for these projects

Basic knowledge of the finite element method

Interest to work with complex programs



The precise topic for a thesis depends on the requirements of the research projects.

If you are interested in a thesis, please contact Dr. Martin Bäker, martin.baeker@tu-bs.de