

# Bachelor/ Mini/ Master Thesis

## „Modelling the strength of steels during Tempering“

### Project

In an ongoing research project, the mechanical behavior of steels must be described quantitatively during tempering. After hardening, steels have to be tempered at suitable temperatures in order to recover some of the toughness of the martensitic structure and partly to relieve the built-up residual stresses. The relief of the residual stresses is due to possible volume changes of the martensite, creep strain and the decrease in strength during tempering.

### Tasks

Within the scope of this student work, the mechanical behavior of the steel is to be investigated and modeled under various conditions. The boundary conditions include austenitization (time / temperature), microstructure state before tempering (martensite / and residual austenite content, carbides) and tempering state (time, temperature, secondary precipitates). For this purpose, appropriate tests have to be planned, carried out and evaluated. Subsequently, the mechanical behavior of the steel is mathematically described during tempering for implementation in a simulation model. The residual stresses have been to be then predicted by simulation.

### Requirements

- Student in Mechanical / Metallurgical Engineering or Material science
- Good knowledge of material science
- Good experience in Excel / Matlab / Abaqus
- Interest in experimental investigations
- 

### Contact

M. Sc. Ali Rajaei  
Augustinerbach 4, Raum 216  
52062 Aachen  
Tel.: +49 241 80 99544  
A.Rajaei@iwm.rwth-aachen.de  
[www.iwm.rwth-aachen.de](http://www.iwm.rwth-aachen.de)

