

## Master 2 Internship: Recycling Steels by Selective Precipitation Treatment Modelling

### Context:

The RESSET ANR JCJC project intends to take care of and value low-quality steel scraps in which tramp elements accumulate over years. These scraps are downcycled as they do not have a composition the research and material development have focused on in the past. The RESSET framework specifically aims at exploring new thermomechanical routes leading to complex precipitation sequences able to strengthen the material in presence of tramp elements, like Cu, and using materials design concepts.

To fulfill this objective, RESSET will develop modelling tools describing phase transformation kinetics depending on processing conditions and for the constrained scrap composition. The focus will be on designing precipitation sequences. The later will be of various kind such as: co-precipitation, sequential precipitation, precipitation concomitantly with another phase transformation. The dominant mechanism will be dependent on the processing conditions and on the nominal composition. It would thus be first needed to correctly predict the precipitation mode.

### Assignment:

In this internship, the student will investigate through literature review and discussion with scrap dealers in Hauts-de-France what are the typical steel scrap compositions (typically E40 scrap group or lower scrap quality). The second and main task will concern the derivation and implementation of thermodynamics and kinetics-based criteria for precipitation mode initiation. To make the framework fully generic, governing equations will be coupled with thermodynamic and kinetic databases.

There is a possibility to pursue into a PhD thesis.

### Candidate profile:

Degree: MSc or MTech in Physics, Chemistry or Material Sciences.

Skills: interest in metals, programming and experimental characterization, rigor, autonomy, ability to work within a multi-disciplinary team.

### Application:

Send a CV and a covering letter to Manon Rolland, UMET, Equipe MPGM, [manon.rolland@univ-lille.fr](mailto:manon.rolland@univ-lille.fr)

### Contact:

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