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Research topics: Modelling of Recrystallization textures, crystal plasticity.

## Continuum modelling of recrystallization textures during continuous annealing.

### Project Description.

In some industrial application is common that steel sheets require to be formed, applying this process demands good draw properties in form the raw material. Usually, formability characteristics are given after rolling and subsequent annealing process and can be described by means of the forming limiting curves, which, in the same way, can be described by Lankford coefficient, also known as R-Value. Lankford coefficient is a measure of the plastic anisotropy and is generally used as an indicator of formability of recrystallized low carbon steel sheets. The R-Value in many cases only can be described with accuracy way if the texture of the metal is known, therefore, it is important to have a model to predict the texture after annealing. In that respect, this project aims to develop a new continuum model, experimentally validated, that is able to simulate the recrystallization texture of a deformed low carbon steel sheet.

### Description of the model.

Being a continuum model does not consider the topological description of the texture. It implies that the model could be faster when it is applied to relative big volumes than topological models. From the deformation texture, obtained after the rolling process, the model uses a crystal plasticity code in order to raise two laws, oriented nucleation and selective growth, additionally, a fragmentation model is considered as well, as shown in figure 1.

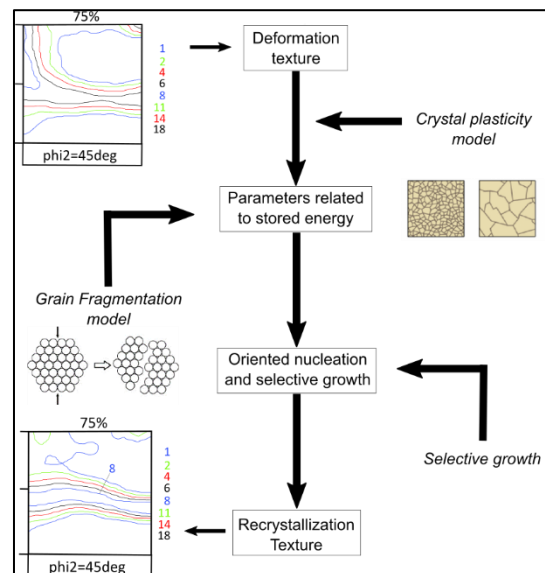


Figure 1. General description of the model to be developed during the project.

### Future work:

Implementation of conventional Crystal Plasticity models in order to understand prediction of recrystallization textures.

### Key Publications:

- [1] L. Kestens and J. Jonas, "Modelling texture change during the recrystallization of interstitial Free Steels," *Metal. Materials Trans. A*, vol. 27A, no. January, pp. 155–164, 1996.
- [2] J. J. Sidor, R. H. Petrov, and L. A. I. Kestens, "Recrystallization textures in aluminium alloys: experimental study and modelling," 2012.
- [3] J. J. Sidor, "Crystal plasticity and continuum mechanics-based modelling of deformation and recrystallization textures in aluminium alloys," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 375, p. 012028, Jun. 2018.