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Research interests:
Crystal plasticity modelling. Mechanical engineering. Texture analysis. Software and programming. Bainitic steels.

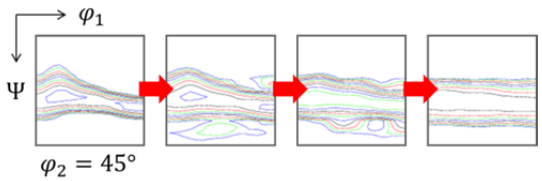
Crystal Plasticity modelling in the BaseForm project

Recent Research activities:

Modelling tasks using crystal plasticity in the framework of the BaseForm project (Bainite and second-phase engineering for improved formability), with the objective of finding new bainitic steels with improved formability properties.

BaseForm
European Project # RFCS-CT-2014-00017

Optimization of crystallographic texture for improved formability
Using crystal plasticity models based on the Taylor-Bishop-Hill theory, the textures of rolled sheet material are optimized in order to obtain better formability properties (improving the predicted constriction ratio or *q-values* in different directions).



Evolution of texture during the optimization of a BCC rolled sheet texture

The added value of the model is that it provides a method to design a path towards the optimal texture in the form of small incremental textural changes. This produces relevant information for the aluminium or steel sheet manufacturer designing thermomechanical processes aiming at improving the deep drawing quality of sheet textures for automotive applications.

Use of crystal plasticity to study damage initiation in multiphase steels
Advanced crystal plasticity models can predict the strain and stress state of the material in the different phases, and therefore the heterogeneities that give rise to damage initiation. Different models are being studied to correlate the simulation results with the experimental outcome of the mechanical tests performed in the BaseForm project.

Correlation between material processing and the obtained microstructure
It is being studied how to integrate crystal orientation information in existing phase transformation models, in order to better understand how a microstructure is obtained as the result of different thermomechanical treatments.

Other Achievements:

Comparison of the Johnson-Cook and VPSC Models to Describe the Constitutive Behaviour of Ti-6Al-4V in an Implicit Finite Element Scheme
J Galán López, P Verleysen, S Naghdy, L Kestens
Material Forming ESAFORM 2015

Mechanical behavior and texture prediction of Ti-6Al-4V based on elastic viscoplastic self-consistent modelling. J Galan-Lopez, S Naghdy, P Verleysen, LAI Kestens, F Coghe, L Rabet, ...
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