

Project 1

Towards property driven process optimization
On a framework for through-process simulation of AA6xxx car body sheet production



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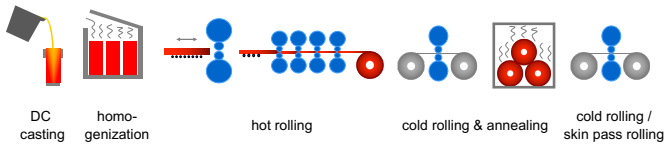
Goal

Modeling of the microstructure evolution along the whole processing chain, and to predict the mechanical properties of the final product.

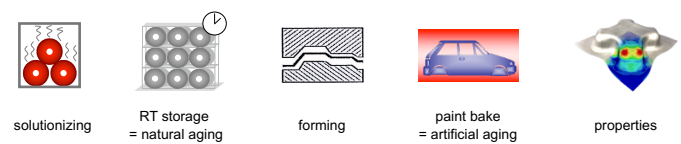


Consortium of this project within AMAP cluster

Process Chain „Rolling“

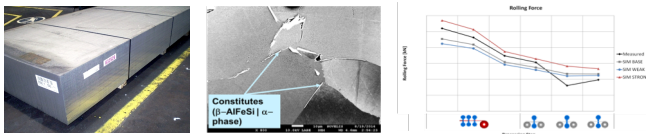


Process Chain „Post Processing“



Sub-Project 1: Rolling

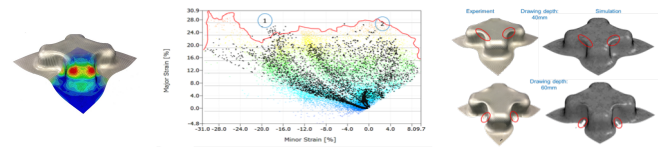
- Industrial processing of one AA 6016 ingot
- Material characterization and data mining after various processing steps for validation of through-process model
- Through-process model for complete processing chain



AMAP P1 full size ingot | SEM micrograph for particle quantification | evolution of experimental & simulated rolling force

Sub-Project 3: Micro-Macro Link & Forming

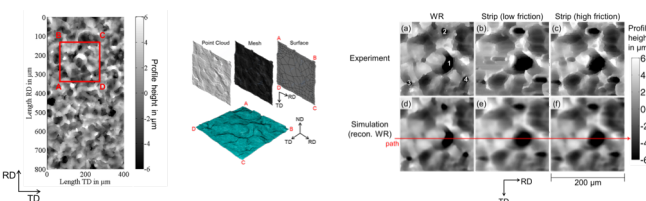
- Generating macro-mechanical input out of microstructure data by using a homogenization method regarding hardening, anisotropy, and forming limits
- FEM-simulation of forming



Cross die exp. superimposed with sim. | FLD of exp. (black) vs. sim. (colored) | comparison of different drawing depth

Sub-Project 2: Aluminium Skin-Pass Rolling

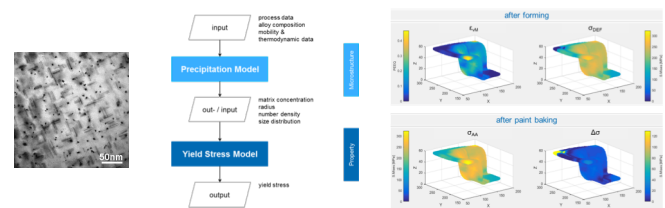
- Investigation on the influence of strip thickness and work hardening on the surface transfer
- Investigation on the influence of rolling speed, work roll roughness, and lubrication on the surface transfer
- Numerical simulation of surface transfer on the basis of model (2D & 3D) and industrial EDT surfaces



Measured surface topography | discretization for 3D Finite Element Model and validation of 3D model [1]

Sub-Project 4: Aging

- Laboratory processing and characterization of the material regarding various aging scenarios
- Development of a physically based model for precipitation evolution
- Development of a model for evolution of yield stress during hardening



TEM micrograph after artificial ageing (AA) | model flowchart | influence of pre-strained areas on final properties after AA [2]

For more information please contact: info@amap.de

[1] S. Hojda, M. Vogd, W. Kang, H. Pawelski, G. Hirt, Numerical Investigation into Aluminium Skin Pass Rolling, 10th International Rolling Conference: 7th European Rolling Conference, 2016, pp. 1133–1142.
 [2] F. Mao, C. Bollmann, T. Brüggemann, Z. Liang, H. Jiang, V. Mohles, Modelling of the Age-Hardening Behavior in AA6xxx within a Through-Process Modelling Framework, ICAA 15, 2016, Chongqing, China