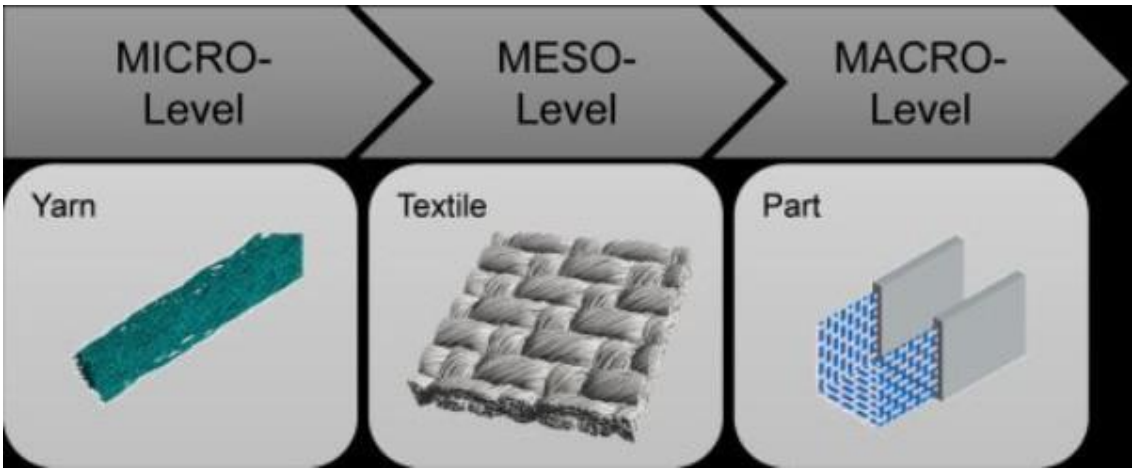
MATCH
Building the European Materials Common House

A4M

Focus on Modelling



Textile-based composite design and application of the multi-scale modelling approach

Textiles are heterogeneous structures with highly anisotropic material properties. This means that the material properties of a textile like strength or elasticity are significantly dependent on the direction of the load and the load case itself. This dependency can be used to develop new adapted material with customized properties. A well-known textile based material is the fibre reinforced plastic (FRP). FRP's have advantageous properties, such as relative

low weight to strength ratios compared to metallic materials and other common structural materials. Therefore, they are used more and more on lightweight designs in aerospace application, construction sector, wind turbines and also automotive industry.

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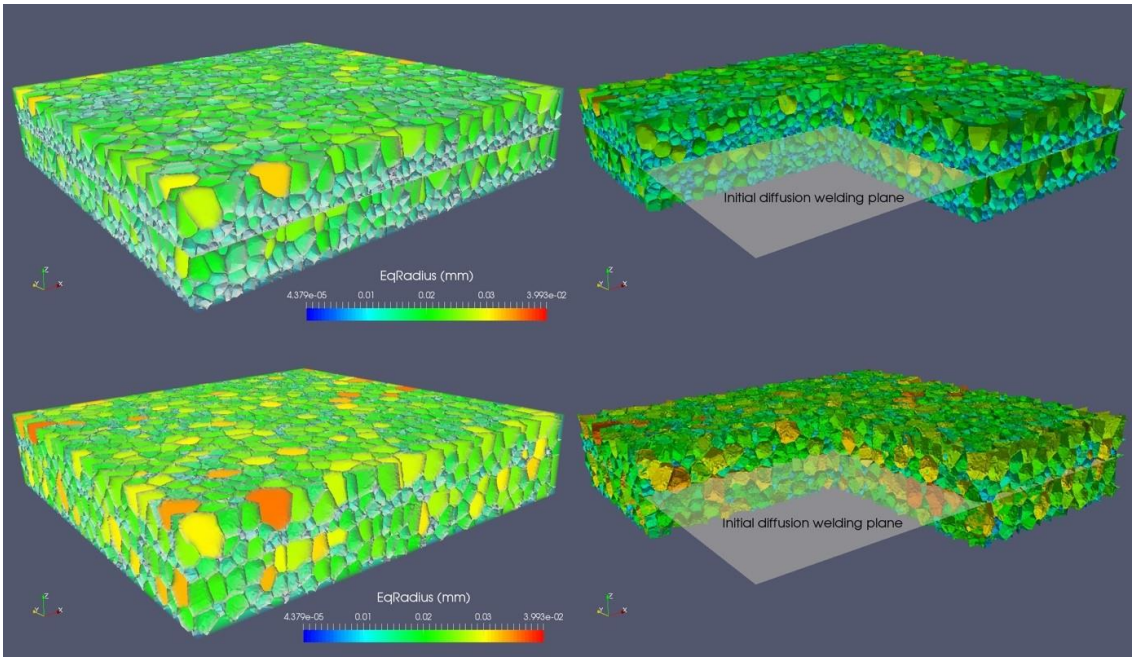

Full field modeling of recrystallization and grain growth thanks to a level set approach: towards modeling by industry

Metal forming modeling can be predictive only if the strain rate, strain and temperature dependency of the flow behaviour are correctly described. The mechanical properties and behaviour of metallic materials mainly depends on the content and structure of dislocation network, this points out the need to incorporate microstructure concepts into the numerical models. The goal is to correctly describe the main physical mechanisms occurring in metals during thermomechanical processes i.e. work-hardening, recovery, grain boundary migration, nucleation and grain growth related to dynamic, static or metadynamic recrystallization. Macroscopic and homogenized models are widely used in the industry, mainly due to their low computational cost. If this mean field framework is quite convenient, it can be synonymous, for a given

material, with a large amount of experiments with advanced laboratory devices. Moreover, the homogenization of the microstructure does not permit to capture some very local phenomena.

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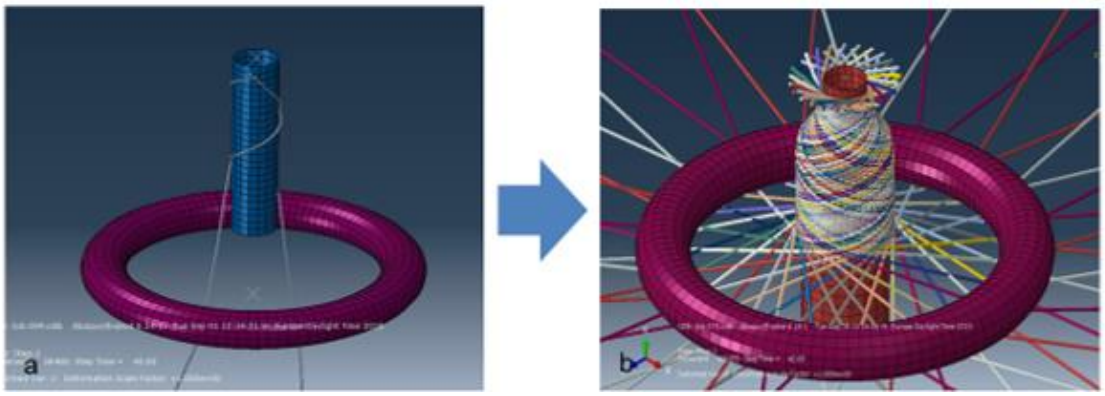

Minimization of computing time for the Finite Element simulation of the braiding process

The radial braiding technology enables to manufacture near net-shaped textile preforms. Because of their crimped textile architecture and the evenly distributed load adsorption, braided reinforced fiber composite materials are characterized by an outstanding failure behavior. These features make braiding to one of the most promising technologies for the production of fiber-reinforced hollow profiles such as braided A-pillars which already get produced in large series. Manufacturing simulation allows faster prototyping, by avoiding long and expensive experiments. This is the reason why the Institut für Textiltechnik is taking efforts to close the digital simulation process chain. The digital process simulation chain extends from the simulation of the braiding process, over the homogenization and validation till to the simulation of entire components.

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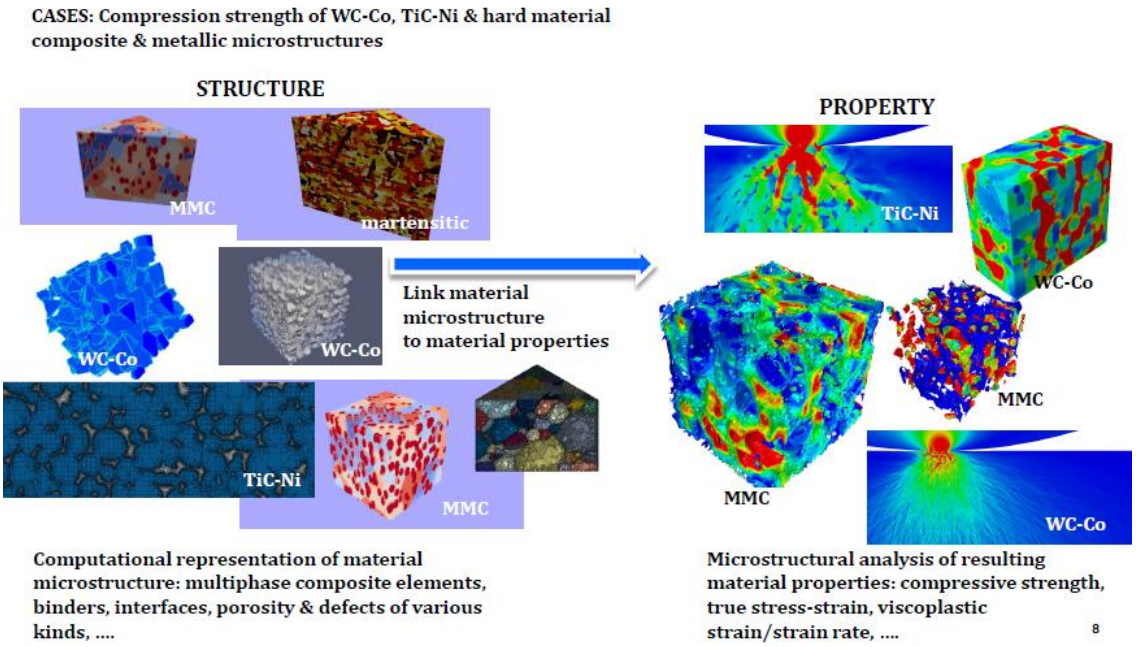

VTT ProperTune – Computational multiscale materials modeling concept

Development of new materials and understanding of material and process behaviour is always a complex equation of crossing interactions. Physical and chemical phenomena are affected from the nano- and/or molecular level up to macroscopic level. Interactions between the material processing, structure, properties and performance (PSPP) need to be understood more deeply. For this purpose, modelling skills have developed rapidly in recent decades, with the support of increased numerical calculation capacity and commercial, open source and in-house multi-level and multi-physics software development. In this publication we are presenting some highlights from our current modelling activities obtained wit VTT ProperTune concept related to powder metallurgical (PM) and additively manufactured (AM) materials. We hope they will inspire new ideas on what could be done and obtained via digital approach to design.

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VI International Workshop on Oxide-based Materials

September 21-24, 2016, Napoli, Italy

The aim of the workshop is bringing together experimental and theoretical scientists of different origins and expertise to exchange information on common scientific research fields, especially on all those materials whose features and properties depend on the interactions between surface and ionic/or molecular species. During the meeting the participants will have the opportunity to compare their knowledge of familiar materials and share their experience on a varied range of different materials, often new materials, which include metal oxides, zeolite and other microporous compounds, mesoporous silicas and silicates, hybrid inorganic-organic compounds, layered materials, biomaterials etc. The VI edition will be focused on perspectives in material science and technological applications, including energy storage.

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FEMS Junior Euromat 2016

July 10-14, 2016, Lausanne, Switzerland

Lausanne and Junior Euromat is a symbiosis since the beginning of the conference in 1992, rendering it the major event for young materials scientists and engineers in Europe. Junior Euromat assembles every two years more than 300 Master and PhD students, Post docs and young scientists from all over the world. The 13th Junior Euromat conference is for the first time organized by the Ecole Polytechnique Fédérale de Lausanne, Materials Department, Powder Technology Laboratory in close collaboration with FEMS and will be held at EPFL from July 10 to 14, 2016. Also for the first time, the Scientific Committee and the Organising Committee are responsible for the content and structure of Junior Euromat, adding further value to this unique event.

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The MATCH project was initiated to strengthen and deepen the Alliance4Materials strategy with a further increased stakeholder network. The project is coordinated by Italian Centro Sviluppo Materiali and the whole consortium consists of 18 partners from nine countries representing the six related European Technology Platforms and several major European material research organisations.

The project started in January 2015 and will continue for 30 months until June 2017. This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646031. Read more