Preface of the guest editors

Computational Manufacturing is a most rapidly developing, multidisciplinary field of re- search at the intersection of computational mechanics, material modelling, applied mathematics and production engineering. The demand for predictive and reliable models and simulations continuously increases and is being driven by established industrial applications as well as new technologies. The area of Computational Manufacturing is by far too broad to be covered in a special issue the aim of this issue is to rather more highlight recent trends and research directions in Computational Manufacturing. These include the investigation of sintering technologies from experiments to verified constitutive models (Rothe et al., Field assisted sintering technology. Part I: Experiments, constitutive modeling and parameter identification) as well as computational homogenisation approaches (Ohman et al., Computational

homogenization of liquid-phase sintering based on a mixed variational format). Additive manufacturing is a key future technology, and both modelling and simulation shall essentially contribute to the design of such processes and the prediction of the material properties of additively manufactured devices. This requires the development and establishment of advanced modelling approaches (Hu et al., Simulation of laser welding using advanced particle methods) and efficient computational methods (Brands et al., Reduced-order modelling for linear heat conduction with parametrised moving heat sources). In order to predict tool lives and effective frictional properties of structured tool surfaces, computational wear models are investigated (Berthelsen et al., Computational modelling of wear application to structured surfaces). Manufacturing processes may result in extreme states of thermomechanical loading which induce phase-transformations. To model such transitions, together with size effects due to the interaction of phenomena acting at different scales of observation, the framework of generalised stresses is applied to the simulation of manufacturing processes, such as cutting and forming (Mahnken et al., The concept of generalized stresses for computational manufacturing and beyond). Further topics on Computational Manufacturing shall be addressed in another upcoming special issue.

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