

## MODELLING AT DIFFERENT SCALES OF PROCESSES INVOLVING MELTING AND SOLIDIFICATION OF METALS

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JOSE CESAR DE SA<sup>\*</sup> AND MICHEL BELLET<sup>†</sup>

<sup>\*</sup> INEGI, University of Porto,  
Rua Dr. Roberto Frias, 4200-465 Porto, Portugal  
cesarsa@fe.up.pt

<sup>†</sup> Mines ParisTech, Centre de Mise en Forme des Matériaux (CEMEF)  
UMR CNRS 7635, Sophia Antipolis, France  
michel.bellet@mines-paristech.fr

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### ABSTRACT

In this Mini Symposium we would like to address modelling of forming processes involving melting and solidification of metals, as in Additive Manufacturing (AM), Casting or Welding. Although different processes they all share some common features associated to those thermomechanical aspects that play an important role in the final material properties at the macroscale.

The multiscale and multiphysics phenomena involved, at different levels of significance, are imperative to be addressed when it comes to characterize important aspects that play a role in the final properties of resulting parts. That may include, for example, the influence of cooling rates on microstructure (formation of different phases, and grain texture), and resulting macro scale properties. This also encompasses modelling of heat sources, as in AM or welding, or more intricate multiphysics modelling approaches, combining fluid flow, solid mechanics, gas or plasma interaction, species transport... in order to predict the occurrence of various defects (porosity, segregation, cracks...) and evaluate their influence on local properties and part behavior.

Modelling at different scales is an important issue when studying these phenomena, but it is at the same time a heavy and costly task, giving way to the use different approaches traditionally used in multidomain approaches, like level-set or phase field, but also recent developments in model order reduction and data driven methodologies, which could also be addressed.