

One year Post-doctoral position at LaMCoS (INSA-Lyon, France) / LTDS (ENISE Saint Etienne, France) in the framework of the project MELTED.

Title: Experimental database for the validation of Direct Energy Deposition (DED) process simulations.

Contacts:

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Framework

MELTED (MastEring the quaLity of addiTive manufacturED parts) is a project supported by the Carnot Institute I@L (<http://www.ingenierie-at-lyon.org/en/>). Several academic and industrial partners from Lyon-Saint Etienne area are involved. The project aims at providing tools to control the residual state of direct energy deposited (DED) metallic parts. This additive manufacturing process builds geometry by blowing metallic particles in a laser molten substrate. The thermal history of such parts is complex and heterogeneous. The thermal-metallurgical couplings are responsible of heterogeneous residual states in terms of microstructure (phases, porosity) and residual stress. The control of this manufacturing level is necessary to guarantee the final state of the part.

The MELTED project couples process monitoring with on-line multiscale and multiphysics simulations in order to control the parameters of the DED process in a closed loop manner.

Aims of the postdoctoral position

The work package in which the postdoc will be involved is devoted to the setup of in-situ DED tests with multimodal monitoring in order to validate the simulation tools. The simulation tools are devoted to the prediction of precipitation state and induced hardness of precipitation-hardened alloys. They are also devoted to the simulation of the thermal-hydraulic effects of the molten bed induced by a laser source with or without metallic particles projection.

The postdoc will take in charge the setup of the in-situ tests, the mechanical and metallurgical characterization of the manufactured parts and the characterization of the DED facility in order to build a very detailed database of the experimental results. He/she will then be in charge of the comparison of the experimental results with the numerical ones.

The candidate will work with the LTDS (ENISE, <http://ltds.ec-lyon.fr/spip/spip.php?article948>) for the in situ monitoring of DED, with MATEIS (INSA-LYON, <http://mateis.insa-lyon.fr/fr/content/metal>) for the metallurgical characterization and with the LaMCoS (INSA-LYON, http://lamcos.insa-lyon.fr/front/equipe_presentation.php?L=1&Equipe=1) for the process simulations. He/she will also collaborate closely with a second postdoc whose work is devoted to the setup of the process real-time simulation tool.

Expected profile

Applicants with the following experiences will be carefully considered: thermal full-field measurement of fast transient phenomena, metallurgical characterization (porosity, residual stress, precipitation, micro-hardening), metal additive manufacturing processes, laser/material interaction.

Conditions

Duration: 12 months
Salary: 2150€ net per month
Beginning of contract: December 2017