

Call for 2 Post-docs

ERC StG 2020 project GAMMA

Position details

- Two 2-year post-doctoral research positions in the MoSES group
- Supervisor: Prof. Manas V. Upadhyay
- Expected start date: March 1, 2021
- Location: Solid Mechanics Laboratory (LMS), Ecole Polytechnique, France

MoSES stands for **M**odeling **S**imulations and **E**xperimental **S**ynergy. The MoSES group strives at (i) developing synergies between multi-scale theoretical models, their transformation into efficient numerical tools to run simulations, and advanced experimental approaches, to understand the multi-scale behavior of structural materials, specifically metals and alloys, and (ii) using the knowledge gained to engineer material microstructures with desired properties. The MoSES group was established by Prof. Manas V. Upadhyay at the LMS.

LMS is a joint research unit between the French national research center (CNRS) and the Ecole Polytechnique. Research at LMS integrates experimental studies as well as the mathematical and numerical modeling of the mechanical and multi-physics behavior of materials and structures over a wide range of spatial and temporal scales.

General context of the project

Additive manufacturing (AM) holds the potential to revolutionize the alloy manufacturing sector through its ability to provide unprecedented control over the design of alloy microstructures during manufacturing. However, the main roadblock preventing its widespread adoption is the inability to design microstructures with desired mechanical responses. An AM process results in the formation of hierarchical microstructures that are extremely sensitive to the process parameters. Minor changes to these parameters can result in very different microstructures that exhibit significant differences in their mechanical response at multiple length scales. Controlling the mechanical response of hierarchical microstructures requires first understanding their formation during the AM process. Current experimental and modeling research efforts are heavily focused on studying the role of melt-pool dynamics and rapid solidification during the AM process. Project **GAMMA** aims at tackling the crucial missing link (Fig. 1), which is the microstructure evolution occurring during the long period after solidification and till the end of an AM process, i.e. during Solid-State Thermal Cycling (SSTC), at varying temperature rates and amplitudes.

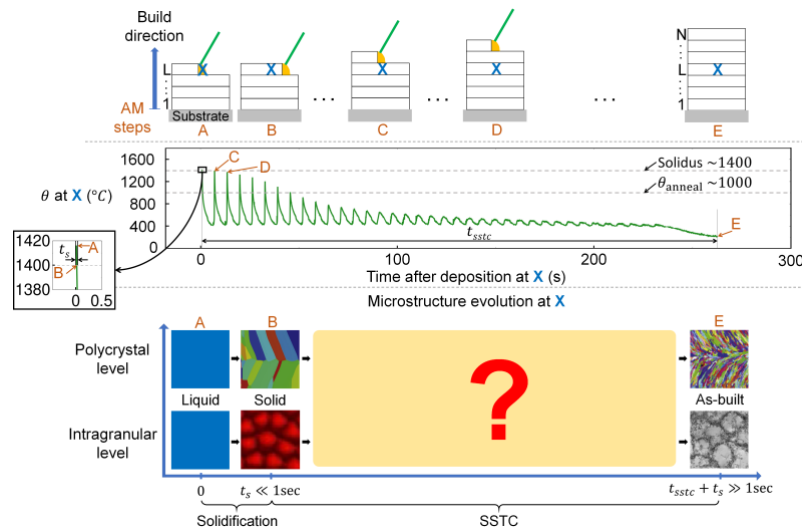


Figure 1: Crucial gap in the current understanding of microstructure formation during an AM process. (Some microstructure snapshots adapted from [Francois et al.](#), [Morris Wang et al.](#) and [Takaki et al.](#))



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Your main tasks

Position 1 (Microscopy experiments): You will design and build AM alloy samples and design and perform SEM and TEM experiments to study microstructure evolution due to SSTC during AM for different material systems. You will create a plan for carrying out SEM and TEM experiments at LMS and partner laboratories.

Position 2 (Synchrotron experiments): You will design and build AM alloy samples and design and perform x-ray synchrotron experiments to study microstructure and internal strain evolution due to SSTC during AM. You will write beamtime proposals for different synchrotron light sources including (but not limited to) SOLEIL, ESRF and PETRA III. You will create a plan for carrying out synchrotron experiments for accepted beamtime proposals.

Both post-docs will lead the execution of their respective experiments together with the group of Prof. Manas V. Upadhyay, analyze the results of their experiments and write scientific papers. Both will give scientific presentations at national and international conferences. Both will support the experimental work of PhD students in the group working on this topic. Both may be required to participate in other experimental activities in this project.

Your profile

- PhD degree in the field of Materials Science, Materials Engineering or Mechanical Engineering with emphasis on in-situ microstructural studies is necessary. Interested candidates aspiring to graduate with a PhD degree before February 1, 2021 are also invited to apply.
- Good communication (oral and written) skills in English are necessary.
- **Position 1 (Microscopy experiments) specific:** Experience in performing, analyzing and publishing papers in scientific journals on SEM/TEM experiments on metals/alloys is necessary. Experience using SEM-FIB is a plus.
- **Position 2 (Synchrotron experiments) specific:** Experience in performing, analyzing and publishing papers in scientific journals on synchrotron diffraction and/or tomography experiments on metals/alloys is necessary.
- Research experience in the field of metal/alloy AM is not necessary but it is a plus.
- Research experience in modeling the micromechanical behavior of materials is not necessary but it is a plus.
- Ability to write scientific articles demonstrated via first-author publications in relevant scientific journals.
- You should be able to work independently as well as in a team. You enjoy working in a multi-disciplinary team having an international background.

Interested candidates

Please choose the position for which you would like to apply and email to recruitment.ercgamma@gmail.com with

- 1) Your up-to-date and detailed CV, and
- 2) Contact information of at least 2 referees willing to provide recommendation letters for you.

Please use only 1 of the following two subject lines for your email

Application for post-doc (synchrotron experiments) on project GAMMA

OR

Application for post-doc (microscopy experiments) on project GAMMA

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Other useful links: <https://portail.polytechnique.edu/lms/en>

<https://www.polytechnique.edu/en>

<https://erc.europa.eu/funding/starting-grants>