

## Research Topic 22 for the ParisTech/CSC PhD Program

FOR APPLICATION, PLEASE CONTACT ADVISOR(S) BY EMAIL WITH COPY TO:

[ali.siadat@ensam.eu](mailto:ali.siadat@ensam.eu) AND [yvon.velot@ensam.eu](mailto:yvon.velot@ensam.eu)

**Subfield: Mechanical Engineering and Manufacturing, Materials Science**

**Arts et Métiers ParisTech**

### **Support structure of laser additive manufacturing processed metal: conception and realization form 3D to 4D.**

**Advisor:** Prof. Mohamed EL MANSORI; ✉: [mohamed.elmansori@ensam.eu](mailto:mohamed.elmansori@ensam.eu).

☎: +33 (0)4.42.93.82.64; 📠: +33 (0)4.42.93.81.15

**Co-supervisor:** Nan KANG, Email: [nan.kang@ensam.eu](mailto:nan.kang@ensam.eu)

#### **Short description of research topics for a PhD:**

Selective laser melting (SLM), a laser assisted powder bed fusion technology, presents an outstanding forming ability in the component with extremely high complex morphology. The support structure plays an important role in SLM process, such as: (1) anchors; (2) dissipate heat; (3) prevent thermal warping etc. Until now numerous works has been carried out in support structure design and realization. However, all those researches limits to the 3D geometrical conception during SLM process. The objective of this work is investigating the effect of *in-situ* stress and strain on support structure design is considered with emphasis on non-destructive residual stress analysis. The outcomes include design guidelines for geometric conception and experimentally realization to meet the SLM processed alloys and their composite.

**Keywords:** selective laser melting; support structure; metal matrix composite; in-situ stress and strain; 3D to 4D

#### **Required background of the student:**

1. Candidates should have a master degree in materials science or mechanical engineering;
2. A background in additive manufacturing, laser materials processing, and topology optimization will be a clear advantage;
3. Candidates should be able to work in a multidisciplinary environment and be fluent in English (both oral and written);

***A list of 5 (max.) representative publications of the group:***

- (1) Kang N.\* et al., (2017) Characterization of microstructure and residual stress of a selective laser melting produced Al-50Si alloy: effect of heat treatments, Materials Characterization, Vol. 130, pp243-249.
- (2) Kang N.\* et al., (2017) On the microstructure, hardness and wear behavior of Al-Fe-Cr quasicrystal reinforced Al matrix composite prepared by selective laser melting, Materials & Design, Vol. 132, pp105-111.