**Research Topic for the ParisTech/CSC PhD Program**

***Field: Materials Science, Mechanics, Fluids***
***Subfield***: Mechanical Engineering

***Title***: Strengthen mechanism of *in-situ* metastable phase in laser additive manufactured aluminum alloy
***ParisTech School***:Paristech-Arts et Métiers

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

Due to the high cooling rate of laser additive manufacturing (LAM) process, the metastable phase could be observed in a variety of alloys, for example, martensitic, metallic glass, quasicrystal etc. Those metastable phase is *in-situ* formed during laser melting process, which leads to a special interface properties between the stable and metastable phases (see in Fig. 1). In this thesis, the strengthen mechanism of metastable phase in LAM processed aluminum alloys will be investigated with focus on the synergistic effect. The XRD, SEM, EBSD, TEM and tensile/wear tests will be employed to characterize the microstructural and mechanical properties. A part of this work will be performed at Texas A&MUniversity.

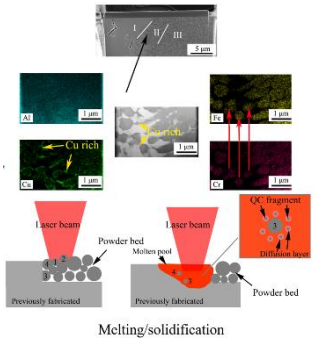

Fig. 1 Quasicrystal reinforced α-Al composite

***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 materials characterization (XRD, SEM, EBSD, TEM) 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) N. Kang, M. El Mansori, X. Lin, F. Guittonneau, H.L. Liao, W.D. Huang, C. Coddet, Composites Part B: Engineering, 155 (2018) 382-390.
(2) N. Kang, M. El Mansori, F. Guittonneau, H. Liao, Y. Fu, E. Aubry, Applied Surface Science, 455 (2018) 736-741.
(3) N. Kang, M. El Mansori, N. Coniglio, C. Coddet, Procedia Manufacturing, 26 (2018) 1034-1040.
(4) N. Kang, H. Yuan, P. Coddet, Z. Ren, C. Bernage, H. Liao, C. Coddet, Materials Science and Engineering: C, 70 (2017) 405-407.
(5) N. Kang, W. Ma, L. Heraud, M. El Mansori, F. Li, M. Liu, H. Liao, Additive Manufacturing, 22 (2018) 104-110.