LABORATOIRE HUBERT CURIEN
UMR • CNRS • 5516 • SAINT-ETIENNE

Post-doc Position

(Release date: December 2nd 2019)

Advanced Ultrafast Laser Engraving for Fashion Industry

Duration: 12 months, kick-off at beginning of 2020

Group: Laboratoire Hubert Curien, CNRS UMR 5516 Université Jean Monnet, St-Etienne, France

Background: The fashion industry is a sector of manufacturing whose products can be literally tailored to a person's size, style preferences and more. One way to perform such tailoring is with the use of lasers. From high-end luxury pieces to personalized jewellery, there are many places for lasers to find their applications - engraving is one of them. Although readily available as an industrial processing solution, laser engraving has great potential to be further developed towards faster, better, and make a new dimension for luxury products, especially with the arrival of new generation of ultrafast lasers.

Objectives: Within the framework of Booster project "Superior En**GRA**ving using advanced **FEM**tosecond laser technology (acronym GRAFEM)", we will be exploring advanced solutions for ultrafast laser engraving of high contrast features, such as zero-taper, color rendering, velvet black *etc*. The solutions could include, but not limited to, spatial/temporal laser beam shaping [1], optimization of laser raster scan strategies [2], laser activated surface chemistry, geometrical optics [3], and so on, and so forth. This exploratory research will encompass experiment design, system setup / validation / calibration, performing test and results analysis.

Applicant profile: The successful candidate must be a team player, results-driven, and self-initiator. He/she should hold a doctorate degree in physics / optics, with a good track record in laser material interactions, especially ultrafast laser processing. A list of key merits is summarized:

- Experience in laser temporal/spatial shaping, and optics design is highly appreciated; to this end, Zemax, and/or OSLO, and/or other ray-tracing programmes would be a real asset
- Sufficient skills in material science to ensure a good level of exchange with partnership specialists from other scientific fields and industry
- Programming skills in synchronizing scanners, laser electronics and translation stages are also regarded as a pro
- Knowledge in French (or enthusiasm for learning it) is considered as an advantage.

Practical information:

The organization: created in 2006, Hubert Curien laboratory (LabHC) is a joint research unit (UMR 5516) of Jean Monnet University, Saint-Etienne, the National Research Centre "CNRS", and the Institut d'Optique Graduate School. It is composed of about 240 members who work on scientific topics related to optics, photonics and microwave, computer science, telecom and image. The laboratory has voluntarily been part of projects supported by the National Research Agency (ANR), the University, the

CNRS and the region while at the same time developing scientific projects with the PRES Labs. Today Hubert Curien Lab has a total of 20 ANR projects in which he is either the pilot or the partner. This represents the majority of all the ANR projects with the University of Saint-Etienne. Furthermore, major emphasis is put on inviting foreign scientists for long or short visits to our Lab. The Lab is also present in several committee programs, in international conferences and in specific European projects in phase with our principal research domains. Asides from science, industrial outreach is also a traditional part of the laboratory activity. The laboratory has in fact been involved in setting up several start-ups.

The research work of project GRAFEM will be carried out in hosting laboratory (LabHC). Given the industrial research nature of the project, some of the activities will possibly be performed at the partner's site, the technology transfer platform: GIE Manutech-USD.

Location: both of above-mentioned entities are located in Saint Etienne (also known as "City of Design" by UNESCO), eastern central France. Other academic/industrial partners of the project are also based in the same region of "Rhone-Alpes". Saint Etienne city is of 3-hour's train ride from Paris, or of less than 1 hour from Lyon. It is also near the Pilat massif and the French Alps, close to excellent hiking trails and ski resorts.

Remuneration: net monthly salary 2000~2500€, depending on experience and skills. Public transport compensation and dedicated health care packages will also be available.

Application: Application including at least a motivation letter and CV should be made to the contact person indicated below. Recommendation letter(s) is not obligatory, but would be taken into consideration if provided.

Contacts: Dr. *Sedao*, Researcher, Hubert Curien Laboratory

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References

1. J. Houzet, N. Faure, M. Larochette, AC. Brulez, S. Benayoun, C. Mauclair, "Ultrafast laser spatial beam shaping based on Zernike polynomials for surface processing", Optics Express, 2016

2. X Sedao, Matthieu Lenci, Anton Rudenko, Alina Pascale-Hamri, Jean-Philippe Colombier and Cyril Mauclair, "Influence of pulse repetition rate on morphology and material removal rate of ultrafast laser ablated metallic surfaces", Optics and Lasers in Engineering, 2019

3. A. V. Kabashin, Ph. Delaporte, A. Pereira, D. Grojo, R. Torres, Th. Sarnet, M. Sentis, "Nanofabrication with Pulsed Lasers", Nanoscale Research Letters, 2010