CHAIR PROFESSOR JUNIOR CNRS - LTM

DESCRIPTION - POSITION PROFILE

## *I- Scientific theme*

Sustainable technologies in microelectronics: critical materials and low-impact processes

## *II- Host laboratory strategy*

LTM is located in a unique environment for developing cutting-edge technological research in the field of microelectronics. As a major hub in the RENATECH network, the laboratory's technology platforms (PTA, CAMELEON, PEGNA 200-300mm https://ltm.univ-grenoble-alpes.fr/technological-platforms-and-ressources) provide a flexible, high-performance tool for developing new technological processes on small samples up to 300mm wafers. Located at CEA Leti, LTM has access to state-of-the-art equipment to meet industrial challenges. LTM was one of the initiators of NEED for IoT, one of the first large-scale projects funded by the Grenoble IDEX in the field of sustainability in microelectronics. He is also involved in steering the microelectronics Labex, one of whose cross-disciplinary axes addresses the issue of sustainability. In terms of training, it co-pilots the UGA SUMMIT Graduate School's thematic program on sustainable microelectronics.

In this context, LTM's strategy is to pursue and strengthen its involvement in the evolution of technological processes and in new sustainable developments applied to microelectronics in order to reduce the environmental footprint of this field of activity.

## *III- International attractiveness strategy*

LTM develops international academic partnerships, enabling it to offer co-tutored thesis subjects (Swansea, Sherbrooke, Tsukuba), as well as industrial partnerships in the form of JDPs (AMAT - USA) or technological development collaborations (SPECS - Germany or ISRL - Israel).

At UGA, LTM has been part of the French delegation welcoming foreign universities (Taiwanese (NTU & NCTU), American (Albany University)) to establish collaborations.

In terms of training, it co-pilots the UGA SUMMIT Graduate School's thematic program on sustainable microelectronics, the aim of which is to attract excellent international students, integrate them into the laboratories through projects (Labworks) and encourage them to pursue a thesis.

## *IV- Summary of scientific project*

The manufacture and use of microelectronic components is costly in terms of energy, water and raw materials. One of the major challenges facing the microelectronics industry is therefore to find innovative solutions that will enable technologies to continue to evolve in a responsible and sustainable way, by limiting the consumption of critical materials and products with a high carbon impact. This scientific project therefore involves the study and development of new technological processes that are less impacting and compatible with CMOS technologies.

Particular attention will be paid to reduce or substitute the use of critical or high-impact materials. In particular, the replacement of lead in PZTs, the reduction in the use of III-V materials via two-dimensional structures, and the implementation of life-cycle analysis studies of various heterogeneous integration processes.

With regard to plasma etching processes, widely used in the patterning stage, the replacement of fluorinated gas PFC (Perfluorocarbon), whose impact on global warming is significant, will be explored.

The expertise required is in the fields of nanotechnology processes, materials, plasmas and Life Cycle Assessment.

## V- *Summary of teaching project*

Theoretical and practical teaching at Master's/engineering school level in engineering courses on microelectronics technologies and devices, providing a vision of sustainability issues and the development of the tools needed for quantification (life cycle assessment, carbon footprint, etc.).