Université Lille Nord de France

Ecole doctorale régionale Sciences Pour l'Ingénieur
Lille Nord-de-France - 072

Titre Thèse	SILICON-BASED MICROSCALE ENERGY HARVESTING FOR AUTONOMOUS CONNECTED OBJECTS		
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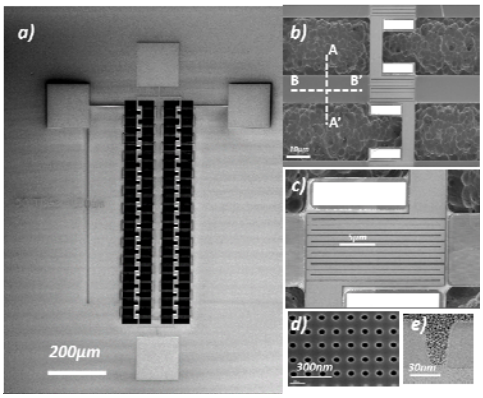
	Contrat Doctoral Etablissement	Lille 1☐ UVHC ☐ ECL ☐ ISEN ☒	
Financement prévu	Président-Région ☐	Région – Autre ☒ Préciser : Projet Européen H2020 « SIROCO » - en cours d'évaluation	
Acquis ☐	Président- Autre ☐ Préciser	DGA – Autre ☐ Préciser	
	Contrat de recherche ☐ Type	Autre ☐	

Résumé du sujet :

It has been predicted that in future IoT more than 20 billion autonomous objects are connected by 2020. The issue of powering all these autonomous devices will become a critical point since regular button batteries will not be able to satisfy the whole demand of power. Furthermore, the global trend is to reduce the use of batteries due to the maintenance cost and to provide more environmental friendly solutions. In many cases the power can be extracted from the surroundings, *e.g.*, exploiting thermal gradients. The aim in this project is to realise a power unit including a microscale thermoelectric generator and capitalising on modern microelectronics fabrication processes. The miniaturisation approach facilitates integration of, not only the energy harvester elements, but also the electronics, and the energy storages on a single chip, providing a significant reduction of volume and mass along with an increased reliability and life-time. The fabrication of the thermoelectric elements, the voltage converter and the energy storage will be based on thin film technology. Eventually, the power unit elements will be all-silicon, exploiting the recently developed nanomembrane know-how.



Scanning Electron Microscope images of SIROCO micro-thermoelectric generators. The free-standing alternating thermocouple legs are p- and n-doped by ion implantation.