



Titre Thèse	THERMOELECTRIC HARVESTERS/COOLERS	
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	Contrat Doctoral Etablissement	Lille 1 <input type="checkbox"/> UVHC <input type="checkbox"/> ECL <input type="checkbox"/> ISEN <input checked="" type="checkbox"/>
Financement prévu	Président-Région <input type="checkbox"/>	Région – Autre <input checked="" type="checkbox"/> Préciser : Projet Européen MARIE SKŁODOWSKA-CURIE ACTIONS Innovative Training Networks (ITN) – « SMOOTH » - en cours d'évaluation
Acquis <input type="checkbox"/>	Président- Autre <input type="checkbox"/> Préciser	DGA – Autre <input type="checkbox"/> Préciser
	Contrat de recherche <input type="checkbox"/> Type	Autre <input type="checkbox"/>

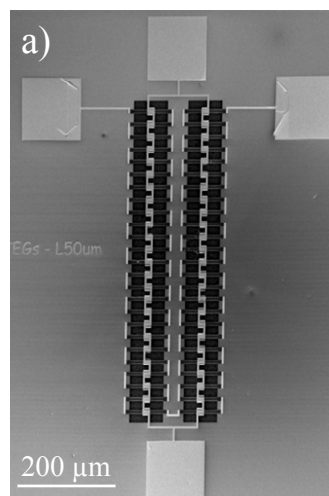
Résumé du sujet :

Thermoelectric generation based on silicon ultra-thin membranes has been developed at IEMN within ERC project “Unconventional Principles of ThermoElectric Generation” (StG n°338179). A proof-of-concept has been established using SOI wafers enabling a few mW/cm² power generation capacity under 45 K temperature difference.

The objective is to upgrade the device from a lab-scale demonstration to an industry transferable technology. The strategy is twofold: i) adapt the technology to CMOS-industry processes, this technological development is planned in the frame of a training with CEZAMAT (Warsaw, Poland). The work will include: membrane patterning process will be changed from low-throughput e-beam lithography to industrially convenient UV lithography; the heat gradient within the membrane plane will be managed by addition of a thermal insulating/electrical insulating/mechanically supporting material; a cap-wafer which takes the role of heat spreader/mechanical support will be fabricated and bonded to progress toward a packaged device.

ii) Explore in the frame in another training at STMicroelectronics (Crolles, France) the potential of these converters for low-noise high-gain light detectors (LIDAR) based on single photon avalanche diodes (Single Photon Avalanche Diode).

This PhD program is proposed in the frame of a European Training Network “Smart Management Of Outreaching Thermal issues” (SMOOTH).



Scanning Electron Microscope image of a silicon micro-Thermoelectric Generator.