Université Lille Nord de France

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

Titre Thèse	ELECTRICAL EFFECTS ON INTERFACIAL THERMAL RESISTANCE		
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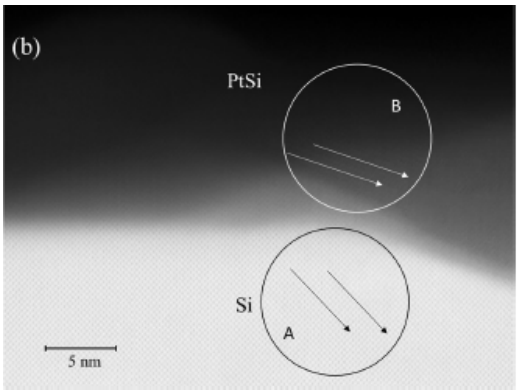
	Contrat Doctoral Etablissement	Lille 1 ☐ UVHC ☐ ECL ☐ ISEN ☒	
Financement prévu	Président-Région ☐	Région – Autre ☒ Préciser : Agence Nationale de la Recherche – ANR « EFFICACE » - en cours d'évaluation	
Acquis ☐	Président- Autre ☐ Préciser	DGA – Autre ☐ Préciser	
	Contrat de recherche ☐ Type	Autre ☐	

Résumé du sujet :

This project aims at improving the understanding of heat transfer at interfaces between a metal and a semiconductor, i.e. at Schottky contacts, and providing solutions to enhance heat transport at contacts. Nowadays, integrated circuits consist of very dense assemblies of heterogeneous materials at lengths scales below the thermally diffusive regime. In such confined objects, interfaces are limiting heat dissipation. In this context, metal semi-conductor junctions are preferred targets for heat transfer optimization.

A systematic study of the impact of metal/SC barrier height on thermal transport will be require the fabrication of dedicated devices on silicon substrates (with selected doping concentration) based on a variety of metals. Candidate materials are (tentative list): platinum, nickel, tungsten, titanium, chromium, gold, molybdenum, palladium, silver and indium. The metal thin films, obtained through e-beam evaporation, will be patterned in order to enable, on the same chip, photothermal radiometry and contacts for electrical characterization. An additional patterning with an insulation Silicon Nitride layer and a resistive strip will be used for 3ω characterization. Electrodes allowing the electrical polarization of the Schottky diode will be also implemented for checking in real time the influence of this polarization on the thermal resistance behavior. On another sub-task, physical characterization (SEM, XPS, EDX) will be performed to control the maximum of parameters (thicknesses, grain size, chemical composition) required.

This PhD project will be lead in collaboration with "Institut Lumière Matière" Lyon, GRESPI, Reims and CETHIL, Lyon in the frame of the EFFICACE Project.



Transmission Microscopy (TEM) image of a PtSi / Si interface. Nature Scientific Reports, ***8****:11352 (2018)*