MIGRATE

MIniaturized Gas flow foR Applications with enhanced Thermal Effects

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No. 643095

MIGRATE (Research and training network on **MI**niaturized **G**as flow fo**R** **A**pplications with enhanced **T**hermal **E**ffects) is planned as a multi-partner Innovative Training Network (ETN – European Training Network), assessing research and applications for thermal aspects of gas microflows. The network consists of 10 beneficiaries and 7 associate partners, spread all over Europe. This unique combination of university research, SME and world leading industrial stakeholders will contribute in a synergetic way to the increase of knowledge about micro scale gas flow heat transfer problems as well as to industrial applications of highly efficient miniaturized devices. Within MIGRATE, a number of Early Stage Researcher (ESR) projects will cover different aspects of enhanced heat transfer and thermal effects in gases, spanning from modelling of heat transfer processes and devices, development and characterization of sensors and measurement systems for heat transfer in gas flows as well as thermally driven micro gas separators to micro-scale devices for enhanced and efficient heat recovery in automotive, aeronautics and energy generation.
The ESRs recruited for the network will undergo training in at least three different locations. Additionally, short stays can be arranged at beneficiaries and associate sites. Moreover, annual network wide workshops and summer schools will ensure that each researcher receives exposure to, and benefits from, the full expertise of the Network.

More information can be obtained from www.migrate2015.eu.

Within the MIGRATE network an

E S R Position

is offered at Bell Labs, Ireland, with the topic

Pulsatile Gas Microflows for Electronics Cooling

Ref. N°: MIGRATE-ESR 11

The position includes secondments at

Panepistimio Thessalias - University of Thessaly (UTH), Greece (5 Months)

University of Strathclyde, United Kingdom (5 Months)

and short stays at MITIS SA, Belgium and Karlsruhe Institute of Technology, Germany for additional testing and microfabrication training.

Short stays at different other beneficiaries or associated may be possible by negotiation.

Main goal: Obtain a fundamental understanding of heat exchange processes using pulsatile gas flows at the microscale. Develop experiments to perform high-fidelity measurements of conjugate heat transfer and perform validation with kinetic modeling techniques.

Duration: 3 years

Expected starting date: 01 – March - 2016

Application deadline: **15 – January – 2016**

MIGRATE

MIniaturized Gas flow foR Applications with enhanced Thermal Effects

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No. 643095

Detailed description of the project:

The demand for high data transfer capabilities in mobile devices is continually increasing to meet global requirements. The growth in portable devices with mobile connectivity has pushed the current demands of telecommunication networks to unprecedented levels. Smaller wireless devices with greater functionality are increasing heat transfer density significantly, and novel methods of improving heat dissipation are required at the microscale using single-phase (gas) and two-phase (liquid-gas) cooling systems. At these scales and/or under certain operating pressures, non-equilibrium flows exist which can lead to velocity slip and temperature jump at the heat exchange surface. While this topic has received attention recently, there is need for comprehensive high fidelity experimental data to compare with kinetic modeling approaches. In addition, many compact devices which pump coolant in practical systems can be inherently unsteady and regularly pulsing, which may alter the surface heat transport characteristics over traditional steady flow observations.

The main objective of this research PhD will be to investigate, both experimentally and numerically, the conjugate heat transfer behaviour due to pulsatile gas microflows from continuum to non-equilibrium regimes. The project is a collaboration between 3 institutions. Experimental research will be conducted at Bell Labs and include development and instrumentation of an experimental facility to measure developing local velocity fields and heat transport from surfaces with high spatial and temporal resolution. Implementation of kinetic modelling approaches including DSMC, discrete velocity and lattice Boltzmann methods will be conducted at University of Thessaly, Greece and University of Strathclyde, UK to simulate the coupled flow/heat transfer configuration.

Expected time schedule

ESR n°11	Year 1		Year 2	Year 3	
	1st stay	2nd stay	3rd stay	4th stay	5th stay
Location	**BELL**	**UTH**	**BELL**	**USTRATH**	**BELL**

1st stay: BELL (9 months) – Literature review on gas heat exchangers for microdevices and pulsatile flows. Design an experimental facility to test prototype gas heat exchange devices across a wide range of operating pressures and temperatures.

2nd stay: UTH (5 months) – Training and implementation of kinetic modelling approaches, such as Direct Simulation Monte-Carlo (DSMC), on the test prototypes.

3rd stay: BELL (10 months) – Perform intensive testing schedule to understand local transport phenomena at varying levels of pulse amplitude, frequency, and gas rarefaction.

4th stay: USTRATH (5 months) – Numerical analysis using discrete velocity and lattice Boltzmann methods.

5th stay: BELL (7 months) – Compare computational with experimental findings. Improve the fundamental understanding of gas dynamics, heat transfer and practical implementation of the micro heat exchange devices. Writing of the PhD thesis.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No. 643095

In addition, two Short Visits (a few weeks each) to MITIS SA, Belgium (for application of techniques within another industrial sector) and Karlsruhe Institute of Technology, Germany (for training in microfabrication) will be scheduled.

Requirements

This is a challenging and highly rewarding course of study and therefore the successful candidate will need to have the following qualifications:

Diploma/Masters level degree in Engineering (Mechanical, Aeronautical, Chemical or similar), Physics, Applied Mathematics or related. Experience in fluid mechanics and heat transfer. Previous experience in experimental testing/acquisition systems with proven ability in numerical data analysis would be beneficial. Excellent English and presentation skills.

Financial information / Salary

Monthly gross salary: 3529 €

Monthly mobility allowance: 600 € (researcher without family obligation) – 1100 € (researcher with family obligation)

Contacts:

For further information please contact either Dr. Jason Stafford: jason.stafford@alcatel-lucent.com or Dr. Nick Jeffers: nick.jeffers@alcatel-lucent.com

Application procedure:

Applications for this position, including a CV with the contact details of three referees, a covering letter, attestation of the diploma / master degree and last transcript of records, should be sent, using the reference number in the subject line and preferably via e-mail, to:

Dr. Jason Stafford: jason.stafford@alcatel-lucent.com

Deadline: 15 – January – 2016

Eligibility of your application can be checked here: www.migrate2015.eu/