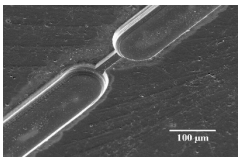


M I G R A T E

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 Dipartimento di Ingegneria Industriale (DIN) of Alma Mater Studiorum – Università di Bologna (Italy) with the topic:

Gas Micro Heat Exchangers

Ref. N°: MIGRATE-ESR 13

The position includes secondments at

MITIS SA (6 months)

and

INSA-Toulouse (4 months)

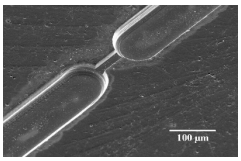
Short stays at different other beneficiaries or associated may be possible by negotiation.

Main goal: Experimental and theoretical analysis of the influence of the main scaling effects (i.e. gas-walls conjugate heat transfer, gas compressibility and rarefaction effects) on thermal performances of micro heat exchangers in which a gas is used as working fluid.

Duration: 3 years

Expected starting date: 01/02/2016

Application deadline: **30/12/2015**



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Detailed description of the project:

UNIBO is engaged on the theoretical and experimental investigation of scaling effects in microfluidic devices from more than 15 years. Micro heat exchangers (μHX) are microdevices able to guarantee very high heat transfer rates in small operative volumes. When gases are employed as working fluids, the heat convection between the gas and solid walls and the conduction along the non-isothermal solid walls enter in competition each to other and the thermal effectiveness of the heat exchanger depends on the flow configuration and on the combination gas-solid walls employed. The PhD thesis is focussed on the analysis of micro-convection of gas flows in micro heat exchangers by considering both rarefied and non-rarefied conditions. The main goal of the PhD thesis is to determine the main rules for the optimisation of the effectiveness of micro heat exchangers by studying different flow configurations (co-current, counter flow, cross flow and hybrid configurations) as a function of microchannels and manifolds geometry and of thermal properties of the heat exchanger's solid walls. The analysis will be conducted for various operative conditions (laminar flow, turbulent flow) and also in presence of rarefaction effects (slip flow). The experimental tests will be based on a versatile μHX specifically designed for testing various materials & surface treatments. The PhD candidate will participate to the design of the experimental test rig and its acquisition data system (LabView) and he/she should be able to support the design by using numerical simulations made by commercial CFD codes (i.e. ANSYS-Fluent or similia) in order to study the temperature distribution inside the μHX. The PhD student will follow the experimental characterization of the μHX and the investigation of the dependence of the thermal effectiveness of μHX on flow configurations, materials, surface treatments, flow regime, rarefaction conditions.

Expected time schedule

ESR n°13	Year 1		Year 2		Year 3	
	1st stay	2nd stay	3rd stay		4th stay	5th stay
Location	**UNIBO**	**MITIS SA**	**UNIBO**		**INSA**	**UNIBO**

1st stay: Literature review on micro convection and thermal performance of micro heat exchangers with gases as working fluids. Design of a versatile μHX for experimental tests.

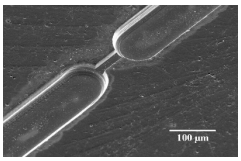
2nd stay: Industrial tests on heat exchangers at MITIS

3rd stay: Experimental tests and numerical simulations at UNIBO on μHX in order to study the dependence of thermal effectiveness on flow configuration, solid wall-gas combination and flow regimes.

4th stay: Experimental and numerical tests on μHX under rarefied conditions (slip flow) at INSA Toulouse.

5th stay: Post processing of the experimental data collected during the PhD and writing of the PhD thesis.

In addition, a Short Visit (a few weeks) to KIT (Karlsruhe Institute of Technology, Karlsruhe (D)) is foreseen in order to fabricate the μHXs useful for the experimental campaign and in order to learn special micro-manufacturing techniques for the fabrication of μHX.



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Requirements

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

- Diploma/Master in Mechanical Engineering, Electrical Engineering, Applied Physics, Fluid-mechanics;
- Skills in heat transfer and fluid mechanics;
- Excellent communication skills and written/verbal knowledge of the English language;
- Good knowledge of ANSYS-FLUENT or equivalent software (i.e ANSYS-CFX, OpenFOAM etc).
- Experience in the field of experimental fluid-mechanics and thermal testing is appreciated as well as the knowledge of LabVIEW.
- Some knowledge in microstructure technology will be an advantage, but not a pre-condition.

Financial information / Salary

Annual gross salary: 39,820 € including employer's contribution for social security.

Annual mobility allowance: 7,200 € (researcher without family obligations) – 13,200 € (researcher with family obligations).

Contacts:

For further information please contact: Prof. Ing. Gian Luca Morini, gianluca.morini3@unibo.it.

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:

Prof. Ing. Gian Luca Morini
Dipartimento di Ingegneria Industriale (DIN)
Alma Mater Studiorum Università di Bologna,
Viale Risorgimento 2 40136 Bologna (I)
(e-mail: gianluca.morini3@unibo.it).
Deadline: 30/12/2015

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