INNOSTORAGE – USE OF INNOVATIVE THERMAL ENERGY STORAGE FOR MARKED ENERGY SAVINGS AND SIGNIFICANT LOWERING CO_2 EMISSIONS

Beneficiaries:

Partners:

D7.2 - Report on Staff Exchanges

	Name and Institution	Date
Prepared by:	Dr. A. Inés Fernández University of Barcelona	22 May 2017
Checked by:		
Approved by:	Prof. Dr. Luisa F. Cabeza University of Lleida	15/06/2017

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1 Objectives

This report reflects the results of the secondments done by Dr. A. Inés Fernández from the University of Barcelona (Spain) that visited Prof. Dr. Jay Khodadadi at the University of Auburn (USA) in January 2017.

The objectives of the secondment were:

a) To enhance the collaboration between the two institutions with a long term perspective.
b) Establish collaboration on new projects.

Each of these objectives is developed in the following sections.

2 Collaboration between UB-AU

2.1 Research work with Prof. Khodadadi

Plaster with PCM

Prof. Khodadadi directed the research made by Mathew Perrella "Optimization of micro-encapsulated phase change materials in a model gypsum wall board". From this research, we found interesting common approaches that will lead us to do a comparative study with previous results at UB with gypsum board with microencapsulated PCM.

Molecular Dynamics

Prof. Khodadadi is working with two pot-graduate students in simulations at molecular levels using molecular dynamics computational methods to study the enhancement of thermal conductivity of organic PCM with nanoparticles. In a meeting with his students, we discussed the methodology, the assumptions made in the simulation and the analysis of the results they are achieving.

2.2 Bilateral meeting with different academics

During the secondment I had the opportunity to meet several academics working in closed fields.

Dr. Jeff Fergus is the academic coordinator of the Materials Engineering degree at Auburn University. We discussed the possibility of students' exchanges at post-graduate level and he explain the agreements they actually have with European Universities.

Dr. Lorenzo Cremaschi is associate professor in the Mechanical Engineering department and his research focuses in heat transfer and thermal management. While he is not researching in thermal energy storage, he was very interested in the possibilities of different storage technologies, to be applied to the systems he is working with.

Prof. Sushil Bahvnani is the Associate Department Chair. During the visit to his laboratory, he explained the different projects they are carrying in developing different systems for cooling electronics by using fluorinated HTF.

Dr. Pradeep Lall is the Director of the NSF-CAVE3 Electronics Research Center, and show us their running projects related with thermo-mechanical reliability of microelectronics under server working conditions.

Dr. Xingyu Zhang main field of expertise is nano-structured polymers, nanocarbons, composites and the related applications in chemical vapor/liquid sensors, organic displays, fuel cells and alternative energy harvesting and storage. He is the inventor of PopTube technology for production of carbon nanotubes (CNT). This microwave based technology made it possible for direct growth of CNT on the surfaces of engineering materials (e.g. carbon fiber, Kevlar, glass fiber, etc.). PopTube technology has great potential for large-scale production of CNT based composites, for composite and energy industries.

Dr. Jimmy Mills is associate professor of the Chemistry Department and works with Prof. Khodadadi in the development of nanoparticles to enhance the thermal conductivity. He was also interested in the modelling at molecular level to increase the knowledge of the mechanisms involved at the nanoscale.

Dr. Maria Auad is Associate Professor at the Polymer and Fiber Engineering Departnemt. We visit her lab, and shared experience in polymers and composites characterization and focused our discussion on her work and interest by the work done by Arcade Aerospace, the company we also visited during our secondment.

Dr. Majid Beidaghi is assistant professor in the Materials Engineering Program. I had interest in sharing information about Materials Engineering program. Moreover, Dr Majid acts as a panel member from the program Partnerships for International Research and Education (PIRE) and we had valuable advice from him to prepare a proposal.

2.3 Meeting with students

YI ZENG: who presented his MD work to date

DOURNA JAMSHIDEASLI: who is starting work on high-temperature PCM. We discussed different options to collaborate and share information.

WENWEN YE: who is starting work on modeling of high-temp. PCM using CFD

SHAFKAT BIN HOQUE: who just started graduate study at AU focusing on PCM

EGEMEN CAGLAR: who just started graduate study at AU. She will focus on a project dealing with thermal sciences of oil/gas processing

3 Increase visibility to the research on TES at AU outreach activities

During this period, different outreach activities have been done:

- Seminar at the Department of Mechanical Engineering, AU
  At the time of the secondment, jointly with Prof. Khodadadi we prepared a seminar at the Department of Mechanical Engineering presenting the work in TES at the University of Barcelona. Moreover, the project INNOSTORAGE was also presented. The announcement of the seminar is attached in the Annex of this document. After this

seminar, and because of the interest of several attendants, we arrange the bilateral meetings and visits explained previously.

- Visit at the company Arcade Aerospace.
  On January 23rd we visited the company Arcade Aerospace with Prof. Jay Khodadadi, where we could see all the infrastructures available there. Ms Ramona Bergó was our host; she showed us the possibilities for non-destructive testing NDT of composite materials.

4 Assessment

4.1 Assessment from A. Inés Fernández

This has been a great opportunity for me to learn from the different researchers at the Department of Mechanical Engineering of Auburn University. The meetings and talks with PhD students were very fruitful and I wish I could contribute to their research from my perspective as a materials scientist. In addition, it was very fruitful to meet other researchers that are not working with TES as main topic but with projects related with thermal management at high or very low temperatures, or materials development and characterization. The experience was excellent, as I had the possibility of knowing another way of working, trying to soak all possible skills experiencing research and knowledge sharing.

5 Annex

AU Seminar announcement

Seminar
Department of Mechanical Engineering
Auburn University

Friday, January 20, 2017, 1:00 PM
ME Conference Room, 1409 Wiggins Hall

Research on Materials for Thermal Energy Storage

Dr. Ana Inés Fernández
Centre **DIOPMA**
Dept. Ciència de Materials i Química Física
Universitat de Barcelona

Abstract

In this seminar, Dr. Fernández will present overviews of the University of Barcelona, her research group (DIOPMA; http://www.diopma.org/) and her research on materials for thermal energy storage (TES) within the framework of the collaborative European Research Project INNOSTORAGE "**Use of innovative thermal energy storage for marked energy savings and significant lowering of CO_2 emissions**" (www.innostorage.eu). Within the INNOSTORAGE project, Auburn University is a partner from non-EU countries. The seminar will focus on research challenges of variety of materials utilized for TES in different applications such as buildings, concentrated solar power (CSP), industrial waste heat recovery, etc. Materials highlights and challenges will be discussed.

Bio: A. Inés Fernández is currently an Associate Professor in the Department of Materials Science and Physical Chemistry at the University of Barcelona. Her background is in Chemistry and she has an MSc and a PhD in Materials Science and Technology. She is a senior researcher of the DIOPMA group, and has co-authored over 100 peer-reviewed papers and patents. During the last 8 years, she has focused her research on the development and characterization of materials for thermal energy storage technologies. She has supervised 6 PhD students with 3 more theses in progress and several undergraduate students' final projects. The research group has been awarded with the Award ANTONI CAPARROS from the University the Barcelona Board of Trustees and the Foundation Bosch i Gimpera in recognition of best project of knowledge transfer (2009, 2012 and 2014). She is the academic coordinator of the Materials Engineering EHEA bachelor degree at the University of Barcelona.

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