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## DELIVERABLE

### **D6.4 Celebration of the 2<sup>nd</sup> SiNERGY Workshop**

**Grant Agreement number: 604169**

**Project acronym: SiNERGY**

**Project title: Silicon Friendly Materials and Device Solutions for Microenergy Applications**

**Call: FP7-NMP-2013-SMALL-7**

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Project website address: <http://www.sinergy-project.eu>

Responsible:	Confindustria Emilia-Romagna Ricerca
Submission Date:	
Due:	31-10-2015
Nature:	O
Dissemination level:	PU

SILICON FRIENDLY MATERIALS AND DEVICE SOLUTIONS FOR MICROENERGY APPLICATIONS



NMP3-SL-2013-604169



## D6.4 Celebration of the 2<sup>nd</sup> SiNERGY Workshop

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### Deliverable description

This deliverable is a short report describing D6.4, which is a deliverable of ‘Other’ nature since it refers to the organization of a workshop event as part of the dissemination activities of the project.

### Executive summary

The aim of the deliverable is describing SiNERGY second Workshop in terms of organization, main objectives and results. As planned in the DoW, the workshop is part of a wider dissemination strategy having as main objective the promotion of silicon materials, silicon technologies and device architectures for long term autonomy using micro energy solutions. Our first workshop was presented as a side event during the LET’S 2014 conference (<http://www.lets2014.eu/>), thus taking advantage of a selected mixed audience as well as of the wider dissemination channel enabled by LET’s. This second one was used for establishing links with other similar EU projects and actions. In fact, the event was a common gathering of four projects funded under FP7-NMP calls dealing with micro-energy harvesting & storage issues. The workshop was held at Fraunhofer Institute for Material and Beam Technology IWS (Dresden) on June 25th- 26th, 2015 under the title ‘Energy Harvesting Systems - FlexTEG 2015’. It was a sort of first event for the ‘virtual’ cluster formed by the NanoCaTe, Matflexend, Manpower and SiNERGY projects.

The workshop was structured as a two days event. The first day was dedicated to the exposition of the objectives and achievements of the four projects. A general overview of the SiNERGY approach based on silicon micro and nanotechnologies was offered by the project coordinator. Presentations of all WP leaders (or deputies) followed, being the SiNERGY session one of the more extended. The second day was devoted to scientific communications from the energy harvesting community.

### The framework: Energy Harvesting Systems - FlexTEG 2015

The dissemination workshop was held on June 25-26th in Dresden. It was thought as a collaborative endeavour of four projects: NanoCaTe, Matflexend, Manpower and SiNERGY. Our role in this workshop was the promotion of the knowledge and the use of micro and nanotechnology (MNT) based miniaturized energy autonomy systems focusing on materials and technologies leading to new families of micro energy harvesters and storage devices. All partners were involved in the dissemination according to their roles and results achieved, contributing to the presentations delivered by the project coordinator and WP leaders/deputies.

Aljoscha Roch from Fraunhofer IWS, coordinator of the NanoCaTe project, acted as a host of the workshop. It comprised two main parts: a first part with 4 sessions corresponding to the four European projects participating and a second part dealing with energy harvesting presentations coming from outside the four projects. In the first part, key note speakers from the different Project Consortiums reviewed their approaches on micro energy materials, technologies and application scenarios. Each project session consisted of three to five main talks; the one from SiNERGY was one of the most extended, signaling our commitment with the initiative. The information has been treated to be public – so no confidential information was released.

The agenda of the event follows.

# WORKSHOP

## „Energy Harvesting Systems - FlexTEG 2015“

June 25<sup>th</sup>- 26<sup>th</sup>, 2015

Fraunhofer Institute for Material and Beam Technology IWS  
Winterbergstraße 28, 01277 Dresden, Germany

**Thursday, June 25<sup>th</sup>, 2015**

08:30	Registration	
<b>Dissemination Workshop for European Projects regarding Energy Harvesting</b>		
09:00	- Welcome and opening	Prof. Dr. Leyens, Fraunhofer IWS
09:10	- Information on coordination activities among EC-funded projects in Energy Harvesting	Sara Giordani, FP7-NMP Project Technical Advisor
	<b>NanoCaTe project</b>	<b>Chair: Aljoscha Roch</b>
09:20	Overview NanoCaTe-Project - <i>NanoCaTe</i>	Aljoscha Roch, Fraunhofer IWS Germany
09:35	Printed polymer thermoelectrics – Approach for thermoelectric polymers and devices - <i>NanoCaTe</i>	Lukas Stepien, Fraunhofer IWS Germany
09:55	Development of bulk TEGs: modelling and experiment - <i>NanoCaTe</i>	Ngo Van Nong, Technical University of Denmark
10:15	Printable energy storage materials for coupled energy harvesting/storage devices - <i>NanoCaTe</i>	1. Benjamin Schumm, Fraunhofer IWS, Germany 2. Maziar Ahmadi, LEITAT, Spain
10:45	System integration of Energy harvesting + storage device / Applications	Thomas Herndl, Infineon Christoph Steffan , TUG

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	- <i>NanoCaTe</i>	
11:05	Coffee break	
	<b>SiENERGY project</b>	<b>Chair: <u>Luis</u> Fonseca</b>
11:20	Overview SiENERGY-Project - <i>SiENERGY</i>	<u>Luis</u> Fonseca CNM-CSIC, Spain
11:40	Top-down and bottom-up approaches for SiNWs based micro-TEGs - <i>SiENERGY</i>	Dario Narducci UNIMIB
12:00	Electrostatic and piezoelectric approaches for micro mechanical harvesters - <i>SiENERGY</i>	Gonzalo Murillo CNM-CSIC
12:20	Thin film/3D approaches for on-chip batteries - <i>SiENERGY</i>	Alfonso Sepúlveda imec
12:40	Integration feasibility and application scenarios - <i>SiENERGY</i>	Martijn Goedbloed imec-NL
13:00	Lunch break	
	<b>MATFLEXEND project</b>	<b>Chair: Robert Hahn</b>
14:20	Results of 1.5 years research on micro batteries and capacitive energy harvesting - <i>MATFLEXEND</i>	Robert Hahn, Fraunhofer IZM, Germany
14:40	Materials and devices developed in MATFLEXEND: prospects for future developments and research partnership - <i>MATFLEXEND</i>	Wolfgang Bock, ANITRA, Germany
15:00	Coffee break	
	<b>MANpower project</b>	<b>Chair: Cian O'Murchu</b>
15:30	Overview MANpower Project - <i>MANpower</i>	Cian O'Murchu, Tyndall National Institute, Ireland
15:50	Low Frequency PiezoMEMS Energy Harvester - <i>MANpower</i>	Nathan Jackson, Tyndall National Institute, Ireland
16:10	Nanostructured Oxides based Electrochemical Supercapacitor - <i>MANpower</i>	Kafil M. Razeeb, Tyndall National Institute, Ireland

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16:30 -	Coffee + Poster Session + Tour Fraunhofer IWS	
17:30	Drinks / Dinner + Poster Session	

### Friday, June 26<sup>th</sup>, 2015

Energy Harvesting Systems - FlexTEG 2015		
9:30	Arrival	
10:00	Nano-power integrated circuits for energy harvesting applications	Aldo Romani, Università di Bologna, Italy
10:20	Dynamics of entropy, charge and energy in thermoelectric generators	Prof. Armin Feldhoff, University Hannover, Germany
10:40	Experimental investigation of the applicability of a thermoelectric generator to recover waste heat from a combustion chamber	Patricia Aranguren Garacochea, Public University of Navarra, Spain
11:00	<i>Coffee break</i>	
11:30	Investigations on thermoelectric materials The challenge to measure the ZT-value	Hans-Fridtjof Pernau Fraunhofer IPM, Germany
12:00	A flexible thermoelectric generator fabricated using bulk materials	Benjamin Geppert, Universität Hannover, Germany
12:20	Experiments on screen printing of thermoelectric modules	Jyrki Tervo; VTT Technical Research Centre of Finland Ltd
12:40	<i>Lunch break</i>	
13:40	Simulation of thermoelectric composites and systems	Petra Streit Fraunhofer ENAS, Germany
14:00	Polymer/Nanoinclusions Composites for Thermoelectric Applications	Jinji Luo, IPF Dresden
14:20	<b>End of Workshop</b>	

## D6.4 Celebration of the 2<sup>nd</sup> SiNERGY Workshop

### Participants

Around sixty people registered and attended the workshop. Attendees from both academia and industry were present.

FlexTEG 2015 Teilnehmer		25.06.2015
Name	Firma	Unterschrift
Kristina Grunewald		
Rebekka Taubmann	Netzsch Gerätebau GmbH	
Alexander Frenzl	Netzsch Gerätebau GmbH	
Masatoshi Takeda	Nagaoka University of Technology	
Malika Bella	STMicroelectronics	
Heiko Reith	University of Hamburg	
Maziar Ahmadi Zeidabadi	Leitat Technological Center	
Patricia Aranguren	Public University of Navarre	
Baoxing Chen	Analog Devices Inc	
Dario Narducci	University of Milano Bicocca	
Martijn Goedbloed	Holst Centre / imec-NL	
Luis Fonseca	IMB-CNM (CSIC)	
Diana Davila	ETH Zurich	
Anton Gavrilov	Nissan Research Center	

Meriam Ben Khedim	STMicroelectronics	
Inci Donmez	IMB-CNM (CSIC)	
Hans-Fridtjof Pernau	Fraunhofer IPM	
Daniel Sperr	Technische Hochschule Nürnberg	
Sandra Martinez Crespiera	Leitat Technological Center	
Paul Biplab	Linköping University	
Danilo Mascolo	Confindustria Emilia-Romagna Ricera	
Annamaria Raimondi	Confindustria Emilia-Romagna Ricera	
Rico Belitz	Fraunhofer IISB	
Jose Domingo Santos Rodriguez	IREC Catalonia Institute for Energy Research	
Roland Dvorsky	Technische Hochschule Nürnberg	
Graeme Cunningham	Bell Labs	
Gonzalo Murillo	IMB-CNM Microelectronics Center of Barcelona	
Ralf Bienert	BAM Federal Institute for Materials Research and Testing	
Alfonso Sepulveda Marquez	IMEC	
André Gall	KIT - LTI	

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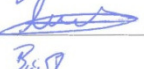

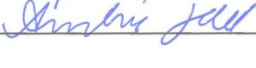
Diego Marini	CNR IMM	<i>Diego Marini</i>
Jinji Luo-Hofmann	Leibnitz-Institut für Polymerforschung Dresden e. V.	
Motohiro Niwa	Asahi Kasei E-materials Corporation	<i>阿部基博 Motohiro Niwa</i>
Petra Streit	Fraunhofer ENAS	<i>Petra Streif</i>
Yasushi Tsurita	Mitsubishi Chemical Holdings	<i>金田 亨</i>
Ngo van Nong	Technical University of Denmark	<i>Ngo van Nong</i>
Robert Hahn	Fraunhofer IZM	<i>R. Hahn</i>
Wolfgang Bock	ANITRA	<i>Wolfgang Bock</i>
Cian O'Murchu	Tyndall National Institute, Ireland	<i>Cian O'Murchu</i>
Nathan Jackson	Tyndall National Institute, Ireland	<i>Nathan Jackson</i>
Kafil M. Razeed	Tyndall National Institute, Ireland	<i>Kafil M. Razeed</i>
Aldo Romani	Università di Bologna, Italy	
Armin Feldhoff	Universität Hannover	
Benjamin Geppert	Universität Hannover	
Jyrki Tervo	VTT Technical Research Centre of Finland Ltd	<i>Jyrki Tervo</i>
Sara Giordani	FP7-NMP Project Technical Advisor	<i>Sara Giordani</i>

Thomsas Herndl	IFAT	<i>T. Herndl</i>
Christoph Steffan	TUG	<i>Christoph Steffan</i>
Melanie Arlt	Fraunhofer IWS	<i>M. Arlt</i>
Marlene Cramer	Fraunhofer IWS	<i>M. Cramer</i>
Ines Dani	Fraunhofer IWS	<i>Ines Dani</i>
Aljoscha Roch	Fraunhofer IWS	<i>A. Roch</i>
Christoph Leyens	Fraunhofer IWS	<i>C. Leyens</i>
Lukas Stepien	Fraunhofer IWS	<i>Lukas Stepien</i>
Benjamin Schumm	Fraunhofer IWS	<i>B. Schumm</i>
Moritz Greifzu	Fraunhofer IWS	<i>Moritz Greifzu</i>
<i>Elisenda Casarells</i>	<i>KIM</i>	<i>Elisenda Casarells</i>



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FlexTEG 2015 Teilnehmer	26.06.2015	
Name	Firma	Unterschrift
Kristina Grunewald		—
Rebekka Taubmann	Netzsch Gerätebau GmbH	
Alexander Frenzl	Netzsch Gerätebau GmbH	
Masatoshi Takeda	Nagaoka University of Technology	武岡 雅敏
Malika Bella	STMicroelectronics	
Heiko Reith	University of Hamburg	
Maziar Ahmadi Zeidabadi	Leitat Technological Center	
Patricia Aranguren	Public University of Navarre	
Baoxing Chen	Analog Devices Inc	
Dario Narducci	University of Milano Bicocca	
Martijn Goedbloed	Holst Centre / imec-NL	—
Luis Fonseca	IMB-CNM (CSIC)	LH
Diana Davila	ETH Zurich	
Anton Gavrilov	Nissan Research Center	

Meriam Ben Khedim	STMicroelectronics	
Inci Donmez	IMB-CNM (CSIC)	
Hans-Fridtjof Pernau	Fraunhofer IPM	
Daniel Sperr	Technische Hochschule Nürnberg	
Sandra Martinez Crespiera	Leitat Technological Center	—
Paul Biplab	Linköping University	Biplab Paul
Danilo Mascolo	Confindustria Emilia-Romagna Ricera	—
Annamaria Raimondi	Confindustria Emilia-Romagna Ricera	—
Rico Belitz	Fraunhofer IISB	U. B. L.
Jose Domingo Santos Rodriguez	IREC Catalonia Institute for Energy Research	
Roland Dvorsky	Technische Hochschule Nürnberg	
Graeme Cunningham	Bell Labs	
Gonzalo Murillo	IMB-CNM Microelectronics Center of Barcelona	
Ralf Bienert	BAM Federal Institute for Materials Research and Testing	R. B.
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Jinji Luo-Hofmann	Leibnitz-Institut für Polymerforschung Dresden e. V.	<i>Jinji Luo-Hofmann</i>
Motohiro Niwa	Asahi Kasei E-materials Corporation	<i>Asahi Kasei Motohiro Niwa</i>
Petra Streit	Fraunhofer ENAS	<i>Petra Streit</i>
Yasushi Tsurita	Mitsubishi Chemical Holdings	<i>Yasushi Tsurita</i>
Ngo van Nong	Technical University of Denmark	<i>Ngo van Nong</i>
Robert Hahn	Fraunhofer IZM	<i>Robert Hahn</i>
Wolfgang Bock	ANITRA	<i>W. Bock</i>
Cian O'Murchu	Tyndall National Institute, Ireland	—
Nathan Jackson	Tyndall National Institute, Ireland	—
Kafil M. Razeed	Tyndall National Institute, Ireland	—
Aldo Romani	Università di Bologna, Italy	<i>Aldo Romani</i>
Armin Feldhoff	Universität Hannover	<i>A. Feldhoff</i>
Benjamin Geppert	Universität Hannover	<i>B. Geppert</i>
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Christoph Leyens	Fraunhofer IWS	—
Lukas Stepien	Fraunhofer IWS	<i>Stepien</i>
Benjamin Schumm	Fraunhofer IWS	<i>Benjamin Schumm</i>
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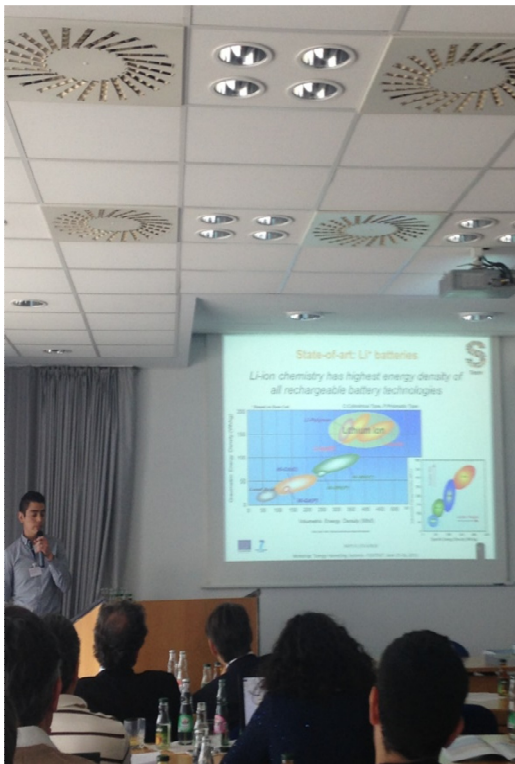
## D6.4 Celebration of the 2<sup>nd</sup> SiNERGY Workshop

### Pictures of the day





## D6.4 Celebration of the 2<sup>nd</sup> SiENERGY Workshop



## D6.4 Celebration of the 2<sup>nd</sup> SiNERGY Workshop

### Presentations on the web

All SiNERGY presentations of the event have been made available for downloading on the SiNERGY website. The same page used for advertising the workshop contains now the link for the download. In doing so, a registration form is required. (<http://sinergy-project.eu/news-events/40-download-sinergy-workshop-presentations-june-25-26-2015-fraunhofer-iws-dresden>)

The screenshot shows a web browser displaying the SiNERGY website. The navigation bar at the top includes links for Home, About, Partners, News & Events (highlighted), Publications, Downloads, Useful links, and Contacts. Below the navigation bar, the breadcrumb trail reads: Home > News & Events > Download SiNERGY Workshop Presentations - June 25-26, 2015 Fraunhofer IWS Dresden.

The main content area is titled "Download SiNERGY Workshop Presentations - June 25-26, 2015 Fraunhofer IWS Dresden". It contains the following text:

The 2nd Sinergy Workshop was held inside the *Energy Harvesting Systems - FlexTEG* - June 25-26, 2015 Fraunhofer IWS Dresden.

Energy harvesting is a means of powering wireless electronic devices by scavenging ambient energy sources such as heat, vibrations, electromagnetic radiation or motion, and their conversion into useable electrical energy. Energy harvesting devices are potentially attractive as replacements for batteries in low power applications.

The FlexTEG-Workshop 2015 has offered a platform to discuss:

- Energy harvesting materials
- Storage materials
- Integrated systems for energy harvesting and storage
- Applications

This workshop has presented two related topics:

- On the first day, 4 European projects presented their work in the field of energy harvesting and storage.
- On the second day, the focus was on flexible thermoelectric devices and energy management.

The workshop has brought together leading experts in this field and newcomers interested in this fascinating and vibrant field. Ample time for discussion and networking has made this event a great marketplace for new ideas and business in energy harvesting.

Below the text, there is a PDF icon and a link: [Click here to see the program](#).

At the bottom, there is a form titled "Fill out the form below to download the presentations of:" with a list of names:

- Luis Fonseca
- Gonzalo Murillo
- Alfonso
- Martijn Goedbloed
- Dario Narducci

On the right side of the page, there are two promotional banners for the SiNERGY Workshop. The top banner is for the 25<sup>th</sup> - 26<sup>th</sup> June 2015 at Fraunhofer IWS Dresden, with a link to download presentations. The bottom banner is for the 30<sup>th</sup> September 2014, also with a link to download presentations. Both banners feature the SiNERGY logo and the text "CLICK HERE TO DOWNLOAD ALL THE PRESENTATIONS".

On the other hand, the main organiser has made all presentations of the workshop available to the event attendees at <https://webdrive.iws.fraunhofer.de/ftp/ftpuser5/>

Downloading requires a generic password and username (contact [Aljoscha.Roch@iws.fraunhofer.de](mailto:Aljoscha.Roch@iws.fraunhofer.de))