	EUROPEAN COMMISSION RESEARCH AND INNOVATION DG	Final Report

Project No: 260117

Project Acronym: HIPIN

Project Full Name: High Performance Insulation based on Nanostructure encapsulation of air

Final Report

Period covered: from 01/11/2011 **to** 31/03/2015

Start date of project: 01/11/2011

Project coordinator name:
Ms. Shivashankari Sundaram

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Project coordinator organisation name:
TWI LIMITED

Final Report

PROJECT FINAL REPORT

Grant Agreement number:	260117
Project acronym:	HIPIN
Project title:	High Performance Insulation based on Nanostructure encapsulation of air
Funding Scheme:	FP7-CP
Project starting date:	01/11/2011
Project end date:	31/03/2015
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Final Report

Please note that the contents of the Final Report can be found in the attachment.

4.1 Final publishable summary report

Executive Summary

In this project, the key enabling technology is the development of a precursor with a higher silica content than the conventional 28% silica content precursor, TEOS. It was anticipated that higher silica content precursor would lead to more robust gels that can be incorporated and formulated into paint, plaster, and panel products that can provide high thermal insulation benefits for new constructions as well as retrofits. For retrofit applications especially, the application of thick insulation to the inside of walls is often unwelcome because it impacts on the internal floor area. Thus, new insulation products that can provide equivalent performance with less thickness would be desirable. The very low thermal conductivity of aerogel (< 0.02 W/(m.K), typically) makes this possible. However, the challenge is in maintaining the porous structure of the aerogels after mixing into building products like paint and plaster.

The insulation concepts developed by the HIPIN project involve the development of a high silica content aerogel precursor, which can provide a cost-effective route to a robust aerogel. The precursor developed during the project contained 58% silica and was made into both hydrophilic and hydrophobic aerogel by a cost-effective method. This aerogel was then incorporated into 3 main types of building products, viz. paint, plaster, and panels. The thermal performance of these three products was validated not only via a lab evaluation of the thermal conductivity of these products but also via demonstrators set up under commercially relevant conditions. Thus, the aerogel containing paint, plaster, and panels were set up on a wall (9 square meters for each application) at Envipark in Turin. Data was collected continually on each of these demonstrators over a 3-month period to validate the insulation benefits of the products.

A detailed techno-economic analysis was completed and showcases the cost-vs-performance balance that can be achieved for each product at commercial scales. It is clear that the cost of the aerogel, its loading in the final products, and the durability of the final product (especially for the plaster) are the key factors that drive the techno-economics of this technology. A detailed life-cycle analysis (LCA) model, including envisaged end-of-life scenarios, was developed within the project for the paint, plaster, and panel products using the HIPIN aerogel.

Summary description of project context and objectives

Aerogels are low density solid materials (density less than 100-200 kg/m3, typically) containing air-filled pores within a solid framework. The encapsulated air not only provides the low density but also imparts very low thermal conductivity, with the very small pore sizes making it possible to achieve thermal conductivities less than the thermal conductivity of still air. Thus, silica-based aerogels have very low thermal conductivity (0.01-0.02 W/(m.k), typically) and can thus potentially be used for high performance insulation materials. However, their fragility has limited application in building products, making widespread use in the construction section not feasible in the past.

The overall goal of the project was to develop new affordable building products based on aerogel, suitable for both retrofits and new buildings. Specifically, the three products investigated during the project are paints, plaster, and panels, which incorporated a low thermal conductivity aerogel in the form of granules. A huge potential market exists for a highly insulating material for new buildings and retrofits that can satisfy the needs of high density housing and new insulation regulations in Europe. All three products can be applied using methods used in the building and construction industry today on the exterior of the building. It can be envisaged that the paint and plaster products can also be used for indoor applications.

The main objectives of HIPIN were:
• Develop aerogel building blocks (precursors) which enable stronger aerogels to be manufactured

and incorporated into typical building products like paint, plaster, and panels.
• Develop an aerogel production route of lower cost, with a realistic cost target of €5 per litre of aerogel possible for manufacturing in large volume quantities.
• Develop the appropriate surface functionality needed to provide properties like hydrophobicity that can promote incorporation of aerogel without the absorption of water and retain the aerogel porous network to contribute to enhanced thermal performance.
• Develop cost-effective and commercially viable methodologies to mix the aerogels into the paint, plaster or panel systems, and apply the system to buildings. This objective includes developing suitable technology to ensure that the systems can be manufactured and applied with reliability and ease using procedures currently used in the industry.
• Develop and test three new products that incorporate aerogel: paint, plaster and paint.
• Generate material properties to demonstrate the thermal conductivity enhancement of the products after incorporation of the aerogel.
• Validate overall system performance data via suitable demonstrators that can be used for dissemination to allow the market to see the quantified benefits of the HIPIN approach.
• Validate the techno-economics of the aerogel-containing products, with the intention of getting the right balance of cost to performance.

Description of main S & T results/foregrounds

The following are the key results from the project:

* Multi-liter scale production of high silica content precursor, scaling up the lab method developed at TWI to an industrially feasible process
• Synthesis protocols for making a high silica content precursor (58% silica, as compared to TEOS, which is a 28% silica precursor used in the literature previously) were developed by TWI.
• Three batches of 450 litres each were produced by Thomas Swan, demonstrating good scale-up robustness as indicated by the uniformity of the 3 batches.

* Investigation of functionalized Stöber silica nanoparticles for the precursor technology
• The incorporation of functionalized Stöber silica nanoparticles into the precursor synthesis route was investigated by TWI as a route to increase the silica content of the aerogel (to render it more robust) as well as introduce suitable functionality via these particles (to render it hydrophobic).
• Separex's proprietary method to render the aerogel hydrophobic was used during the scale-up for the demonstrators and the technology for incorporation of the functionalized silica nanoparticles into the aerogel precursor synthesis protocols was not scaled-up.
• Aerogel thermal conductivity of < 0.01 W/(m.K) as a monolith and ~ 0.015-0.03 W/(m.K) in granular form) was obtained.

* Production of robust aerogel using HIPIN precursor
• Separex produced over 500 liters of aerogel for the demonstrators.
• Cost-effective methods for hydrophobization of aerogel were used in cases where such a surface treatment was found to be necessary to preserve insulation performance after incorporation into the paint and plaster matrix.
• Over 450 liters of hydrophobic aerogel was sent to Vimark for incorporation into a plaster formulation.
• 100 grams of <1mm powder of the same hydrophobic aerogel was sent to ICI for incorporation into a paint formulation, which was used for the paint demonstrator.
• Over 500 liters of hydrophilic aerogel was sent to Methodo for incorporation into a polyurethane (PU) matrix and making over 36 panels using this PU-aerogel composite.

* Paint containing aerogel - ICI
• Optimised formulation of paint with aerogel developed to provide thermal performance via a thin layer of paint (about 250 microns)
• ICI has delivered a formulation that shows an improvement in thermal performance compared to standard paint, without affecting any other properties. The thermal conductivity of the HIPIN paint is 0.49 W/(m.K), compared to 0.64 W/(m.K) for a standard paint.

* Plaster containing aerogel – Vimark
• Optimised formulation of a plaster containing the HIPIN aerogel was developed to provide high

thermal performance. The plaster containing the aerogel was then used for setting up the demonstrator using traditional machine application of the plaster onto a wall.
• Vimark delivered a plaster-aerogel formulation with good thermal insulation possible both at lab and demo scale compared to standard plaster. The HIPIN plaster has a thermal conductivity (lambda) value of 0.034 W/(m.K), compared to 0.47-0.5 W/(m.K), for a standard plaster.
• Durability and strength of the plaster product with high aerogel loadings (> 30%) needs to be further optimized before commercialisation is possible.

* Panels containing aerogel – Methodo
• Optimised formulation to produce a panel with aerogel developed by Methodo after trials with a number of polymer systems
• Methodo has developed a methodology to combine the aerogel with polyurethane in a panel.
• The panel developed by them gave a lambda value of 0.025 W/(m.K), a 25% improvement over a standard insulation board made of EPS (lambda value of 0.036 W/(m.K).

* Demonstrators
• Demonstrators of the paint, plaster, and panel products were set up at Envipark by ICI, Vimark, and Methodo, respectively, in September-October 2014.
• Measurement of thermal performance of the 3 products was undertaken over the winter months (Nov 2014 to February 2015) and the calculated U-value for these walls, with and without HIPIN products, was measured, validating the performance benefits for all 3 products.
• The thermal resistance of the wall for these building elements was measured per the ISO 9869:1994 standard.
• Data from the labs and demonstrators was used to quantify the improvements in thermal performance possible from the HIPIN paint, plaster, and panel products

* Techno-economic analysis
• A detailed techno-economic analysis was carried out by Orient Research to understand the applicability of the HIPIN products in the market, with respect to performance and economics. This was based on an estimate of the price of the aerogel, assuming an initial introduction of the HIPIN aerogel into the market at the 250 tons per annum scale.

* Modelling
• Mathematical models were development to predict the reduction in heating energy achievable using the three products. Theoretical models were developed that will enable the partners to predict the thermal conductivity of the materials for varying loadings of aerogel.
• The theoretical models confirmed the measured values and provide a basis for further product optimisation after the project.

* Lifecycle analysis (LCA)
• Eco-profiles, including envisaged end-of-life scenarios, have been created for the aerogel and the HIPIN paint, plaster, and panel products via a detailed LCA model developed by Envipark
• For example, HIPIN plaster when compared to thermal insulating plaster (Vimark's thermal insulating plaster Thermocalce, lambda =0.088 W /mK) gave a Global warming potential (100 years) reduction of 87% and Primary Energy Demand (PED) reduction of 47%.

* Exploitation
• A detailed report (PUDF) was completed to outline the exploitable results, including market analysis to understand risks and intervention needed to help commercially exploit the technologies.
• The cost of the aerogel and its loading are the key drivers that will drive commercial exploitation.

Potential impact and main dissemination activities and exploitation results

The construction sector is the highest energy consumer (about 40 %) in Europe and also the main contributor to GHG emissions (about 36 % of the EU's total CO2 emissions. The energy policy scenarios by 2050 show that a 40 % to 50 % reduction of the building 'sector'energy consumption is mandatory by 2050, where fossil fuel heating represents a major share (60 %). Thus, a large reduction in the CO2 emissions from buildings is critical in the coming decades. This can be achieved via improved energy efficiency through the use of high-performance insulation and energy-efficient systems. The walls, roof and windows of a building account for the majority of its

heat loss in winter and heat gain in summer and hence research into novel improved cost-effective insulation technology is a positive investment for Europe and the world's future. Although novel building materials are often used in new constructions, availability of cost-effective insulation for existing buildings is critical since the percentage of existing buildings is very high in Europe. Reduction of thickness can be a key need for retrofits due to lack of design options in existing buildings. Thus, aerogels, with their very low thermal conductivity (0.01-0.02 W/(m.k), typically) provide an innovative option for improved thermal performance for the existing building infrastructure in Europe.

Thus, the 3 products developed within the HIPIN project all allow for this improved thermal performance for retrofits as well as new construction due to their superior thermal properties as compared to existing insulation options. Although cost of the aerogel and its loading are the key drivers that will drive commercial exploitation, we anticipate that the cost of aerogel can drop significantly further if the demand is higher and economies of scale can be generated. Within the HIPIN project, the price of the aerogel was estimated to be €2.20/liter (much less than the cost target of €5 per litre of aerogel mentioned in the original HIPIN proposal). This was based on a possible initial market of 250 tons of aerogel. However, if the demand increases significantly to thousands of tons and the capital investment needed for aerogel plants to meet this demand can be made, a target price of aerogel of less than of €1 per litre of aerogel can also be envisaged at these high demands.

The technology developed within HIPIN project was widely disseminated across Europe during the project. Specific activities for dissemination included:
• Creating and maintaining a public web site - http://www.hipin.eu.
• Publications in technical trade journals about the project aim (first phase) and the project results (second phase) focusing on how it will benefit the sector in the long term.
• Attending and presenting HIPIN technology via technical seminars and presentations at relevant leading conferences in the nanomaterials and building materials industry sector.
• Production of flyers which were distributed at several exhibitions and conferences and updated at the end of the project for future dissemination.
• A HIPIN Workshop at which relevant stakeholders from the building industry were invited; this was held at Envipark, the site of the demonstrators, allowing attendees to visually see the building products on a wall.

Overall, dissemination was carried out via presentations at 14 conferences, attendance at 11 exhibitions, participation in EEB and other related workshops and seminars (9), and 8 articles published in relevant journals, including one peer-reviewed journal article.

Five main exploitable results came out of the project, namely:
1) A high silica content precursor for aerogel synthesis - A pre-polymerised TEOS precursor with a silica content of 58% (TES58)
2) Hydrophobic and hydrophilic aerogel based on the high silica content precursor (TES58), providing a low thermal conductivity (< 0.02 W/(m.K)).
3) Thermal insulating plaster containing a suitably surface treated aerogel and providing high insulation benefits (thermal conductivity < 0.034 W/(m.K)).
4) Thermal insulating panels based on a polyurethane (PU) – HIPIN aerogel composite, for easy installation on buildings and thermal conductivity 25% lower than the traditional insulation material used in buildings (EPS).
5) Thermal insulating paint formulation containing HIPIN aerogel that can provide enhanced insulating properties compared to standard paint (thermal conductivity 24% lower than standard paint), without affecting any of the other paint properties (e.g.: gloss, sheen, abrasion resistance, etc.)

Address of project public website and relevant contact details

Project website address http://www.hipin.eu

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4.2 Use and dissemination of foreground

Section A (public)

Publications

LIST OF SCIENTIFIC PUBLICATIONS, STARTING WITH THE MOST IMPORTANT ONES										
No.	Title / DOI	Main author	Title of the periodical or the series	Number, date or frequency	Publisher	Place of publication	Date of publication	Relevant pages	Is open access provided to this publication ?	Type
1	Analysis on existent thermal insulating plasters towards innovative applications: Evaluation methodology for a real cost-perf orma nce comparison 10.1016/j.enb uild.2014.03.037	Silvia Barbero , Marco Dutto , Cinzia Fe rrua , Amina Pereno	Energy and Buildings	Vol. 77	Elsevier BV	Netherlands	01/07/2014	40-47	No	Peer revie wed

LIST OF DISSEMINATION ACTIVITIES								
No.	Type of activities	Main Leader	Title	Date	Place	Type of audience	Size of audience	Countries addressed
1	Exhibitions	TWI LIMITED	EEB PPP Workshop	15/03/2012	Brussels	Scientific community (higher education, Research)		Europe
2	Exhibitions	TWI LIMITED	International symposium on super-insulating materials	26/04/2012	Brussels	Scientific community (higher education, Research) - Industry		International
3	Oral presentation to a scientific event	TWI LIMITED	NICOM 4 Conference	21/05/2012	Agios Nicolas, Greece	Scientific community (higher education, Research) - Industry		Europe
4	Exhibitions	TWI LIMITED	6th European Silicon Days	05/09/2012	Lyon, France	Scientific community (higher education, Research) - Medias		Europe
5	Flyers	TWI LIMITED	XXI International Materials Research Congress	12/08/2013	Cancun Mexico	Scientific community (higher education, Research) - Industry - Medias	500	Worldwide
6	Organisation of Conference	IMPERIAL CHEMICAL INDUSTRIES LIMITED	CEPE Annual Conference and General assembly. Sponsored event by Akzo-Nobel (ICI)	25/09/2013	Prague, Czech Rep	Industry	50	Worldwide
7	Oral presentation to a scientific event	ORIENT RESEARCH MUHENDISLIK VE DANISMANLIK HIZMETLERI TICARET LIMITEDSIRKETI	Climamed	18/11/2013	Turkey	Scientific community (higher education, Research)	50	Europe, Turkey
8	Oral presentation to a scientific event	ORIENT RESEARCH MUHENDISLIK VE DANISMANLIK HIZMETLERI TICARET LIM	Mechanical Eng Chamber, MMO	01/08/2013	Turkey	Scientific community (higher education, Research) - Industry	50	Turkey

		ITEDSIRKETI						
9	Oral presentation to a scientific event	ORIENT RES EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	EEB Workshop	01/03/2013	Brussels, Belgium	Scientific comm unity (higher educat ion, Research)		Europe
10	Exhibitions	TWI LIMITED	European Coatings Congress	18/03/2013	Nuremberg/Germa ny	Scientific comm unity (higher educat ion, Research) - Ind ustry		Europe
11	Exhibitions	VIMARK SRL	Ecobuild	01/04/2013	London UK	Scientific comm unity (higher educat ion, Research) - Ind ustry		Europe
12	Exhibitions	ORIENT RES EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	Yapi Fuari Fair	24/04/2013	Turkey	Industry		Turkey
13	Exhibitions	PARCO SCIENTIFI CO E TECNO LOGICO PER L'AMBIENTE - E NVIRONMENT PARK SPA	Euronanoforum 2 013 NANO E2B Cl uster Workshop	20/06/2013	Dublin, Ireland	Scientific comm unity (higher educat ion, Research)		Europe
14	Exhibitions	VIMARK SRL	Made Expo	02/10/2013	Milan	Industry		Europe
15	Exhibitions	VIMARK SRL	Restructura	21/11/2013	Turin, Italy	Industry		Europe
16	Web sites/Appli cations	TWI LIMITED	BUILD UP Web Se minar on Superi nsulating materials: State of the art ap plications and long term performance	05/11/2013	Online	Scientific comm unity (higher educat ion, Research) - Ind ustry		Worldwide
17	Flyers	TWI LIMITED	High Performance Insulation Worksho p	28/11/2013	ZAE Bayern	Industry		Worldwide
18	Videos	ORIENT RES	FP7 EEB cluster	31/12/2013	Video	Scientific comm		Europe

		EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	video			unity (higher educat ion, Research) - Ind ustry		
19	Oral presentation to a scientific event	TWI LIMITED	Indtech-2014	09/04/2014	Athens	Scientific comm unity (higher educat ion, Research) - Ind ustry		Europe
20	Oral presentation to a scientific event	TWI LIMITED	NanoStruc 2014 Conference	20/05/2014	Madrid	Scientific comm unity (higher educat ion, Research)		Europe
21	Oral presentation to a scientific event	VIMARK SRL	CBEST 2014, Int ernational Conf erence on Building Envelope Systems and Technologies	09/06/2014	Aachen, Germany. Paper accepted for the conference	Scientific comm unity (higher educat ion, Research) - Ind ustry		Worldwide
22	Posters	ORIENT RES EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	ECTP-E2BA Confe rence	17/06/2014	Brussels	Scientific comm unity (higher educat ion, Research)		Europe
23	Posters	VIMARK SRL	8th ENERGY FORUM on Advan ced Building Skins	28/10/2014	Bressanone, Italy	Scientific comm unity (higher educat ion, Research) - Ind ustry		Europe
24	Oral presentation to a scientific event	ORIENT RES EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	ICCMREA’ 2015	23/03/2015	Rome	Scientific comm unity (higher educat ion, Research) - Ind ustry		Europe
25	Exhibitions	VIMARK SRL	KlimaHouse	23/01/2014	Bozen, Italy	Industry		Europe
26	Flyers	IMPERIAL C HEMICAL IN DUSTRIES L IMITED	ECO build 2014	04/03/2014	London UK	Scientific comm unity (higher educat ion, Research) - Ind ustry		Europe

27	Flyers	VIMARK SRL	Mosbuild	01/04/2014	Moscow	Scientific community (higher education, Research) - Industry		Worldwide
28	Oral presentation to a scientific event	TWI LIMITED	EEB-PPP workshop	01/04/2014	Brussels	Scientific community (higher education, Research)		Europe
29	Oral presentation to a scientific event	TWI LIMITED	1st Cluster Workshop - Advanced Materials and Nanotechnology Cluster (AMANAC) for Energy Efficiency in Buildings	08/04/2014	Athens	Scientific community (higher education, Research)		Europe
30	Exhibitions	ORIENT RESEARCH MUHENDISLIK VE DANISMANLIK HIZMETLERI TICARET LIMITEDSIRKETI	YAPI Fuarlari	07/05/2014	Istanbul, Turkey	Industry		Turkey
31	Exhibitions	ORIENT RESEARCH MUHENDISLIK VE DANISMANLIK HIZMETLERI TICARET LIMITEDSIRKETI	ISK-SODEX International mechanical, solar, similar systems (abbr)	07/05/2014	Istanbul, Turkey	Industry		Worldwide
32	Exhibitions	SEPAREX SAS	14th European Meeting on Supercritical Fluids	18/05/2014	Marseille, France	Scientific community (higher education, Research) - Industry		Europe
33	Oral presentation to a scientific event	TWI LIMITED	2nd AMANAC Cluster Workshop -	09/10/2014	Chambery, France	Scientific community (higher education, Research)		Europe
34	Posters	SEPAREX SAS	Seminar on Aerogel	06/10/2014	Hamburg, Germany	Scientific community (higher education, Research)		Europe
35	Interviews	ORIENT RESEARCH MUHENDISLIK VE DANISMANLIK HI	Yesil Bina	01/06/2015	Turkey - Interview with trade journal about HIPIN	Industry		Turkey

		ZMETLERI T ICARET LIM ITEDSIRKETI						
36	Interviews	ORIENT RES EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	Yalitim, Turkey	01/01/2015	Turkey - Interview with trade journal about HIPIN	Industry		Turkey
37	Interviews	ORIENT RES EARCH MUHE NDISLIK VE DANI SMANLIK HI ZMETLERI T ICARET LIM ITEDSIRKETI	Net zero energy use in buildings	01/01/2015	Turkey - Interview with trade journal about HIPIN	Industry		Turkey

Section B (Confidential or public: confidential information marked clearly)

LIST OF APPLICATIONS FOR PATENTS, TRADEMARKS, REGISTERED DESIGNS,UTILITY MODELS, ETC.					
Type of IP Rights	Confidential	Foreseen embargo date dd/mm/yyyy	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant(s) (as on the application)

OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND								
Type of Exploitable Foreground	Description of Exploitable Foreground	Confidential	Foreseen embargo date dd/mm/yyyy	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use or any other use	Patents or other IPR exploitation (licences)	Owner and Other Beneficiary(s) involved
Commercial exploitation of R&D results	A high silica content precursor for aerogel synthesis	No		A pre-polymerised TEOS precursor with a silica content of 58%	Building and Construction	Depends on market demand for aerogel from building products companies (partners of HIPIN or others)	Licensing from TWI	TWI (owner). Thomas Swan developed scale-up and commercialisation know-how.
Commercial exploitation of R&D results	Hydrophobic and hydrophilic aerogel	No		Robust aerogel based on the high silica content precursor TES50 and rendered hydrophobic by Separex's proprietary method.	Building and Construction	1 - 3 years, scale-up to commercial quantities depends on end-users demand needs.	Proprietary process will remain confidential to Separex	Separex
Commercial exploitation of R&D results	Thermal insulating plaster containing a suitably surface treated aerogel	No		Thermal insulating plaster formulation with aerogel in the formulation.	Building and Construction	1.5 - 2 years after project completion	Confidential know-how for direct commercialisation by Vimark	Vimark
Commercial exploitation of R&D results	Thermal insulating panels made using aerogel as one of the components	No		Thermal insulating panels based on a polyurethane (PU) - aerogel composite for easy installation on buildings.	Building and Construction	1.5-3 years after project completion	Confidential know-how for direct commercialisation by Methodo	Methodo
Commercial exploitation of R&D results	Paint system with enhanced insulating properties.	No		Paint formulation with aerogel that can provide insulation benefits.	Building and Construction	6months - 2years from project completion	Confidential know-how for direct commercialisation by ICI	ICI (Akzo-Nobel)

ADDITIONAL TEMPLATE B2: OVERVIEW TABLE WITH EXPLOITABLE FOREGROUND	
Description of Exploitable Foreground	Explain of the Exploitable Foreground
A high silica content precursor for aerogel synthesis	A pre-polymerised TEOS precursor with a silica content of 58% represents a significant improvement to the precursor formulation. TEOS 28 which is commonly used for aerogel production. The precursor TEOS58 will enable aerogels to be more robust and to improve the thermal performance of final products where the aerogel is used.

Hydrophobic and hydrophilic aerogel	Robust aerogel based on the high silica content precursor made within the HIPIN project. It is made hydrophobic to varying extents via Separex's proprietary method. The proprietary method for hydrophobization and processes developed for optimal granulation provide a cost-effective and robust manufacturing process for the aerogel.
Thermal insulating plaster containing a suitably surface treated aerogel	Thermal insulating plaster with aerogel in the formulation provides improved insulating performance over normal plaster. Increased thermal performance can be achieved at lower thickness. Long-term durability and cost of the aerogel will be key factors in driving the aerogel-based insulating plaster to commercialisation.
Thermal insulating panels made using aerogel as one of the components	Methodo has developed mechanically robust thermal insulating panels where a polyurethane (PU) - aerogel composite has been first developed. For the demonstrators, an encapsulated polystyrene (EPS) shell was used to sandwich the PU-aerogel composite but may not be necessary commercially. The aerogel composite gives high insulating properties to the panels, which can be cut to measure and bolted to any support for easy installation.
Paint system with enhanced insulating properties.	A paint with HIPIN aerogel was proven to provide a statistically significant lower thermal conductivity than standard paint. Other paint properties were not affected by the addition of the aerogel. Thus, the project demonstrated proven insulation benefits and heating energy reduction benefits from a decorative paint, sufficient to deliver noticeable (to customers) and marketable heating energy savings.

4.3 Report on societal implications

B. Ethics

1. Did your project undergo an Ethics Review (and/or Screening)?	No
If Yes: have you described the progress of compliance with the relevant Ethics Review/Screening Requirements in the frame of the periodic/final reports?	

2. Please indicate whether your project involved any of the following issues :

RESEARCH ON HUMANS

Did the project involve children?	No
Did the project involve patients?	No
Did the project involve persons not able to consent?	No
Did the project involve adult healthy volunteers?	No
Did the project involve Human genetic material?	No
Did the project involve Human biological samples?	No
Did the project involve Human data collection?	No

RESEARCH ON HUMAN EMBRYO/FOETUS

Did the project involve Human Embryos?	No
Did the project involve Human Foetal Tissue / Cells?	No
Did the project involve Human Embryonic Stem Cells (hESCs)?	No
Did the project on human Embryonic Stem Cells involve cells in culture?	No
Did the project on human Embryonic Stem Cells involve the derivation of cells from Embryos?	No

PRIVACY

Did the project involve processing of genetic information or personal data (eg. health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?	No
Did the project involve tracking the location or observation of people?	No

RESEARCH ON ANIMALS

Did the project involve research on animals?	No
Were those animals transgenic small laboratory animals?	No
Were those animals transgenic farm animals?	No
Were those animals cloned farm animals?	No
Were those animals non-human primates?	No

RESEARCH INVOLVING DEVELOPING COUNTRIES

Did the project involve the use of local resources (genetic, animal, plant etc)?	No
Was the project of benefit to local community (capacity building, access to healthcare, education etc)?	No

DUAL USE

Research having direct military use	No
Research having potential for terrorist abuse	No

C. Workforce Statistics

3. Workforce statistics for the project: Please indicate in the table below the number of people who worked on the project (on a headcount basis).

Type of Position	Number of Women	Number of Men
Scientific Coordinator	1	1
Work package leaders	1	4
Experienced researchers (i.e. PhD holders)	8	10
PhD student	1	0
Other	9	12

4. How many additional researchers (in companies and universities) were recruited specifically for this project?	0
Of which, indicate the number of men:	0

D. Gender Aspects

5. Did you carry out specific Gender Equality Actions under the project ?	No

6. Which of the following actions did you carry out and how effective were they?	
Design and implement an equal opportunity policy	Not Applicable
Set targets to achieve a gender balance in the workforce	Not Applicable
Organise conferences and workshops on gender	Not Applicable
Actions to improve work-life balance	Not Applicable
Other:	

7. Was there a gender dimension associated with the research content - i.e. wherever people were the focus of the research as, for example, consumers, users, patients or in trials, was the issue of gender considered and addressed?	No
If yes, please specify:	

E. Synergies with Science Education

8. Did your project involve working with students and/or school pupils (e.g. open days, participation in science festivals and events, prizes/competitions or joint projects)?	No
If yes, please specify:	

9. Did the project generate any science education material (e.g. kits, websites, explanatory booklets, DVDs)?	Yes

F. Interdisciplinarity

10. Which disciplines (see list below) are involved in your project?	
Main discipline:	1.3 Chemical sciences (chemistry, other allied subjects)
Associated discipline:	2.3 Other engineering sciences (such as chemical, aeronautical and space, mechanical, metallurgical and materials engineering, and their specialised subdivisions; forest products; applied sciences such as geodesy, industrial chemistry, etc.; the science and technology of food production; specialised technologies of interdisciplinary fields, e.g. systems analysis, metallurgy, mining, textile technology and other applied subjects)

Associated discipline:	

G. Engaging with Civil society and policy makers

11a. Did your project engage with societal actors beyond the research community? (if 'No', go to Question 14)	No
11b. If yes, did you engage with citizens (citizens' panels / juries) or organised civil society (NGOs, patients' groups etc.)?	
11c. In doing so, did your project involve actors whose role is mainly to organise the dialogue with citizens and organised civil society (e.g. professional mediator; communication company, science museums)?	
12. Did you engage with government / public bodies or policy makers (including international organisations)	
13a. Will the project generate outputs (expertise or scientific advice) which could be used by policy makers?	

H. Use and dissemination

14. How many Articles were published/accepted for publication in peer-reviewed journals?	1
To how many of these is open access provided?	0
How many of these are published in open access journals?	0
How many of these are published in open repositories?	0
To how many of these is open access not provided?	1
Please check all applicable reasons for not providing open access:	
publisher's licensing agreement would not permit publishing in a repository	No
no suitable repository available	No
no suitable open access journal available	No
no funds available to publish in an open access journal	No
lack of time and resources	No
lack of information on open access	Yes
If other - please specify	
15. How many new patent applications	0

('priority filings') have been made? ("Technologically unique": multiple applications for the same invention in different jurisdictions should be counted as just one application of grant).	

16. Indicate how many of the following Intellectual Property Rights were applied for (give number in each box).	
Trademark	0
Registered design	0
Other	0

17. How many spin-off companies were created / are planned as a direct result of the project?	0
Indicate the approximate number of additional jobs in these companies:	0

18. Please indicate whether your project has a potential impact on employment, in comparison with the situation before your project:	Difficult to estimate / not possible to quantify, None of the above / not relevant to the project

19. For your project partnership please estimate the employment effect resulting directly from your participation in Full Time Equivalent (FTE = one person working fulltime for a year) jobs:	0Difficult to estimate / not possible to quantify

I. Media and Communication to the general public

20. As part of the project, were any of the beneficiaries professionals in communication or media relations?	No

21. As part of the project, have any beneficiaries received professional media / communication training / advice to improve communication with the general public?	No

22. Which of the following have been used to communicate information about your project to the general public, or have resulted from your project?	
Press Release	Yes
Media briefing	No
TV coverage / report	No
Radio coverage / report	No
Brochures /posters / flyers	Yes
DVD /Film /Multimedia	No
Coverage in specialist press	Yes
Coverage in general (non-specialist) press	No

Coverage in national press	No
Coverage in international press	No
Website for the general public / internet	Yes
Event targeting general public (festival, conference, exhibition, science café)	No

23. In which languages are the information products for the general public produced?	
Language of the coordinator	Yes
Other language(s)	Yes
English	Yes

Attachments	HIPIN aerogel monolith.jpg, HIPIN project logo.png, HIPIN flyer_Feb 2015_Final.pdf
Grant Agreement number:	260117
Project acronym:	HIPIN
Project title:	High Performance Insulation based on Nanostructure encapsulation of air
Funding Scheme:	FP7-CP
Project starting date:	01/11/2011
Project end date:	31/03/2015
Name of the scientific representative of the project's coordinator and organisation:	Ms. Shivashankari Sundaram TWI LIMITED
Name	
Date	02/06/2015

This declaration was visaed electronically by Debbie MCCONNELL (ECAS user name nconnede) on 02/06/2015