D6.5 – IPR Manual

WP6

Lead Partner: RINA-C

Partner Contributors: SELENA, UCL, FOCCHI, BGTEC, UNIVPM, SAES, FENIX

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Project Acronym	EENSULATE
Project Title	Development of innovative lightweight and highly insulating energy efficient components and associated enabling materials for cost-effective retrofitting and new construction of curtain wall facades
Grant Agreement n°	723868
Funding Scheme	Innovation Action
Call	H2020- EEB-2016
Topic	EEB-01-2016 Higly efficient insulation materials with improved properties
Starting Date	1st August 2016
Duration	42 Months

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Abbreviations and Acronyms

[IPR] – Intellectual Properties Rights
[B] – Background
[F] – Foreground
[M] – Making
[U] – Using
[L] – Licensing
[O] –Other
[ER] – Exploitable Result
[GA] – Grant Agreement
[CA] – Consortium Agreement
[IMC] – Innovation Management Committee
[SC] – Steering Committee
[EPO] – European Patent Office
[EPC] – European Patent Convention
[PCT] – Patent Cooperation Treaty
[DWPI] – Derwent Word Patent Index
[DPCI] – Derwent Patent Citation Index
[IPC] – International Patent Classification

Introduction

This document represents the deliverable D6.5: IPR Manual, due to Month 18 (January 2018). Activities reported within the document are related to Task 6.2 “IPR Management and Standardization” whose description as for GA is reported below, for sake of clarity.

In this task, the team will manage the Intellectual Property for the new knowledge created within the project. An IPR manual based on the assessment of pre-existing knowledge of the project partners, their potential contribution to the foreground project IP, and potential overlap of IP will be developed as well to prepare the shaping of the IP strategy of the consortium. The innovation developed inside the Consortium will be protected following the rules described in the Consortium Agreement. Within this framework, the progress in the accomplishment of the different deliverables and milestones will be checked, once a result is available IPR leader will investigate the novelty of the invention and proposing to the Consortium the possibility to apply for a patent protecting the generated IP. Main results patent mapping studies will be specified and delivered in order to raise the IPR protection scheme. The overall IPR strategy of the project is to ensure that partners are free to benefit from their complementarities and are able to fully exploit their market position. The standardization aspects will be also covered and prototypes qualified before their full scale integration in demo buildings to be compliant with procurement practices, even when installed at pre-commercial stage.

In this framework, the purpose of the present document is to provide an overview of the main provisions related to intellectual property rights, use and dissemination of the results (also named foreground) generated by the EENSULATE project. It is however recommended to always refer to prescriptions included in the Consortium Agreement and Grant Agreement and to consult the Project Coordinator and the Innovation Manager for any issue concerning IPR protection.

First of all, an overview of project and related results is provided (Chapter 1) with the aim of keeping it updated with respect to the novelty of the proposed invention, the intention of applying for “formal” or “informal” IP protection as well as the partners responsible and involved in the single result.

Then, a glossary of the main terminology in the framework of IPR protection is provided (Chapter 2), with specific focus on the following aspects concerning background and project results applied to EENSULATE field of application.

- Access rights
- Ownership
- Transfer
- Protection, use and dissemination

Afterwards, since Exploitation activities and IPR management are strictly linked together, Exploitation Procedures are shortly described with particular focus on dissemination of project results and knowledge transfer (Chapter 3).

Finally, IPR protection measures are provided with the aim of shaping the IP strategy of the consortium. This (Chapter 4) will be the core part of the document and will be refined and updated along the project as

long as the results became clearer and their protection secured. As the document is due to month 18, further updates will be included within Deliverables related to Exploitation Activities.

1 EENSULATE project and results

1.1 EENSULATE Project at a glance

The goal of the EENSULATE project is to reduce emissions of buildings by developing a new curtain wall system. This system is designed to promote insulation through glass facades by making them significantly cheaper and easier to handle. Moreover, the individual components are going to be designed so that it can be used in retrofitting as well. Such retrofitting aims to bring existing curtain wall buildings to "nearly zero energy" standards.

The EENSULATE project will develop three new components together with the curtain wall design. The polyurethane spray foam (mono-component or bi-component) will bring the benefits of insulating foam without the toxic downside of existing products. The lightweight thin double pane vacuum glass will be easy to handle. Apart from this, the glass will be manufactured on a relatively low temperature which decreases the energy needs for the production. A new thermos-tunable coating will give the glass several luxury functionalities such as self-cleaning and solar gain control.

1.2 EENSULATE Exploitable Results

Exploitable results are the innovative results coming from a project which have either commercial or social significance and can be exploited as a standalone product, process or service. These results might need further R&D, prototyping, engineering or validation before they become commercially exploitable. The following table lists the EENSULATE's exploitable results identified so far. The information was updated according to partners' inputs and it has been further discussed during the Exploitation Workshop that took place in October 4-5, 2017.

N°	Exploitable result	Lead partner
1	Highly insulating environmentally friendly bi-components foam	SELENA
2	Thermo-tunable coating	UCL
3	Design manufacture and installation of high-insulation façade	FOCCHI
4	Testing protocols for durability assessment of glazed surfaces	UNIVPM
5	Innovative sealant for vacuum insulated glass	SAES
6	Innovative getter for vacuum insulated glass	SAES
7	Window framing solution compatible with EENSULATE glass	BGTEC
8	EENSULATE mono-component foam for windows application	SELENA

After the project ends, each partner will implement measures which will be defined to ensure exploitation of its results (either directly or indirectly) by one or more of the following methods:

a) using them in further research activities (outside the action);
b) developing, creating or marketing a product or process;
c) creating and providing a service, or
d) using them in standardisation activities.

2 IPRs principles[1]

2.1 Background

Background Information (B) means, in the context of Horizon 2020, *"any data, know-how or information whatever its form or nature, tangible or intangible, including any rights such as intellectual property rights, which is:*

- held by participants prior to their accession to the action;
- needed for carrying out the action or for exploiting the results of the action; and
- identified by the participants."

To summarise, background includes pre - existing IP, know how, knowledge and any additional data that is needed for carrying out the project and that each partner is going to bring to the project itself.

Before the beginning of the project it is necessary to ensure that any information needed for the smooth running of the project is accessible to project partners, therefore matters related to access right, have already been addressed in the EENSULATE Consortium Agreement.

2.2 Results (Foreground)

Results (called Foreground in FP7 projects) mean any data, knowledge and information, whatever their form or nature, whether or not they can be protected, which are generated in the action as well as any attached rights, including intellectual property rights.
Concerning protection of results and dissemination, the following aspects should be considered:

- Owners must ensure adequate protection for the Results capable of industrial or commercial application in conformity with Grant Agreement and Consortium Agreements;
- In absence of protection and transfer of Results, owner(s) shall inform EC which may take the responsibility of protection and granting of access rights. Beneficiary concerned may only refuse if its interests are impaired;
- Any Disclosure (publication, announcements etc.) shall not affect the protection of Results. Consortium agreement may specify details concerning protection and publication but not in conflict with EC Contract.

In the specific case of the EENSULATE project, Table 2.1 shows the background (B) and foreground (F) associated to the partners involved in each related exploitable result.

[1] https://www.iprhelpdesk.eu/node/2227

Table 2.1: Analysis about IPR on background information (B) and IPR on foreground information (F)

Results / Partners	1	2	3	4	5	6	7	8
1-RINA C			B,F				B,F	
2-AGC								
3-SAES					B,F	B,F		
4-SELENA	F							F
5-UCL		B,F						
6-EVONIK	B							B
7-ULSTER								
8-TVITEC			B,F				B,F	
9-FOCCHI	F		B,F				B,F	
10-UNSTUDIO			B,F				B,F	
11-FENIX								
12-BGTEC			F				B,F	
13-UNIVPM				B,F				
14-GMD								

The exploitation claims of each partner will be reported in this section. The methods of exploitation are resumed in the following four cases identified by a single letter, describing the intention of the partner to exploit the results by:

- **M = Making** the products, manufacturing and selling or directly implementing through own facilities and skills
- **U = Using** the result, implemented with own knowledge to develop new ranges of products or newer processing. Furthermore, the direct or indirect use of foreground in further research activities other than those covered by the project, or for developing, creating and marketing a product or process, or for creating and providing a service
- **L = Licensing** the result, therefore earning from a negotiation towards third parties outside the Consortium
- **O = Other**, any other exploitation means (e.g.: consultancy, services, etc.)

The analysis of the EENSULATE exploitation claims is reported in Table 2.2 on how each partner could exploit the foreseen results for instance by producing and selling them (M); by using them internally (U) (new research project, lectures in case of universities, etc.); by licensing them (L); or by providing services (O) (consultancy, etc.).

Table 2.2: Exploitation claim analysis-Legend: M: producing and to selling it; U: using internally ex, universities: lectures, new project; L: licensing; O: services, consultancy etc.

Results / Partners	1	2	3	4	5	6	7	8
1-RINA C		U,O	U,O				U,O	
2-AGC								
3-SAES					M,U	M,U		
4-SELENA	M,U,L							M,U,L
5-UCL		M						
6-EVONIK	M,U							M,U
7-ULSTER								
8-TVITEC		U	M,U	U	U	U	M,U	
9-FOCCHI	U	U	M,U	U	U	U	M,U	
10-UNSTUDIO	U	U	U		U	U	U	
11-FENIX	O							
12-BGTEC	U	U	U				M,U	
13-UNIVPM		O	O	M,U,O				
14-GMD			O				O	

2.3 Access Rights

Access Right, in Horizon 2020, simply stands for the right to use project results or background.

During the implementation stage of the project, partners need to give access rights to their background and results being created in order to allow other partners to carry out their work on the project and/or exploit their results. The requests should be done in writing, which can take for instance the format of an email with acknowledgement of receipt, if participants so decide in their Consortium Agreement. Participants granting access rights may request to have in place an agreement, particularly when they wish to make the access rights limited to some conditions (e.g. stronger confidentiality commitments).

The following table gives an overview of the general conditions concerning the granting of access rights as established in the GA:

Purpose	Access to background	Access to results
Implementation of project	Royalty – free, unless otherwise agreed by participants before their accession to the grant agreement.	Royalty - free
Exploitation of owned project results	Subject to agreement, access rights shall be granted under fair and reasonable conditions (which can be royalty – free)	

The above mentioned rules are normally valid unless stated otherwise. One new feature of Horizon 2020 concerns the granting of access rights to a project's results, not only to the European Union, but also in specific cases to Member States. Access rights for the European Union's institutions and bodies will be granted on a royalty-free basis, limited however to non-commercial and non-competitive use since their purpose relates merely with the development, implementation and monitoring of EU policies and programmes.

2.3.1 Access Rights on the Background of the Project

In attachment 1 of the Consortium Agreement, the Parties have identified and agreed on the Background of the project and have also, where relevant, informed each other that access is subjected to legal restrictions or limits. Anything not identified in the Consortium Agreement [2]shall not be object of Access Right obligations regarding Background.

As to **UNIVERSITY COLLEGE LONDON (UCL)** it is agreed between the Parties that, to the best of their knowledge, the following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

- Design, modeling and fabrication of antireflective "moth-eye" nanostructures
- Design, modeling and fabrication of superhydrophobic surfaces on glass, silicon and metals
- Surface functionalization to lower surface energy by –OH hydroxylation and deposition of thin Teflon layer
- Finite difference time domain (FDTD) simulations expertise on optical nanostructures
- Finite Element Method (FEM) simulations of heat exchange phenomena
- Deposition of oxide thin film including VO2, TiO2 and SiO2 by Chemical Vapor Deposition methods
- Deposition of oxide thin film by Atomic Layer Deposition
- Synthesis of precursors for VO2 deposition
- Synthesis of thermochromic nanoparticles by using hydrothermal routes
- Expertise in nanotechnology fabrication methods including nanoimprint lithography, roll-to-toll lithography, electron beam lithography, UV lithography, colloidal lithography
- Expertise in reactive ion etching processes, metal deposition, O2 plasma etching

No specific limitations and/or conditions for implementation and exploitation have been foreseen for the identified background.

[2] Consortium Agreeement, EENSULATE project GA 723868

As to **UNIVERSITY OF ULSTER (ULSTER)** it is agreed between the Parties that, to the best of their knowledge, the following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions shall be as mentioned hereunder:

- Know-how and information relating to the edge sealing and fabrication of vacuum glazing units
- Design simulation of vacuum glazing structure

No specific limitations and/or conditions for implementation and exploitation has been foreseen for the identified background.

As to **UNIVERSITA' POLITECNICA DELLE MARCHE (UNIVPM)** it is agreed between the Parties that, to the best of their knowledge, the following background is hereby identified and agreed upon for the Project. Specific limitations and/or conditions, shall be as mentioned hereunder:

- Comfort Eye sensor for IEQ monitoring (patent details: National: MO2013A000279 International: PCT/IB2014/065033)
- Assessment of occupants' comfort perception with objective and subjective monitoring methodologies, calculation methodologies
- Protocols for durability assessment of reflective properties of building coatings (natural and accelerated tests)
- Algorithms, software, tools and guidelines developed in the following EU projects: FP7 InTUBE, FP7 COOL-COVERINGS, FP7 SportE2, FP7 CETIEB, HORIZON2020 INSITER, H2020 New TREND

No specific limitations and/or conditions for implementation and exploitation has been foreseen for the identified background.

2.4 Results ownership[3]

According to the Horizon 2020 Rules for Participation and models grant agreement, project results belong to the participant generating them. Given the collaborative nature of European projects, some results can be jointly developed by several participants, therefore situations of joint ownership might arise.

2.4.1 Joint ownership

Results are jointly owned when:

- they have been jointly generated by two or more participants
- it is not possible to:
- establish the respective contribution of each beneficiary, or
- separate them for the purpose of applying for, obtaining or maintaining their protection.

Usually joint ownership occurs in very specific situations, mainly for technological results.

It is best practice to regulate in the Consortium Agreement the rules on joint ownership of results. However, since this agreement is entered into force before the launch of the project and the development

[3] https://www.iprhelpdesk.eu/Fact-Sheet-IP-Management-H2020-Project-Implementation-and-Conclusion

of the results, participants shall, if needed, establish a **separate joint ownership agreement** during the project implementation, defining practically the allocation and terms of exercising their ownership.

Unless otherwise agreed in the Consortium Agreement or in the joint ownership agreement, according to the default grant agreement rules, each joint owner may grant non-exclusive licences to third parties to exploit the jointly-owned results (without any right to sub-license), if the other joint owners are given:

- at least 45 days advance notice and
- fair and reasonable compensation.

Since managing jointly owned results is a complicated issue, participants have the possibility to implement a different ownership regime from the one established in the Consortium Agreement, provided that the new agreement is done in a written form.

In fact, they may decide for instance to transfer ownership to one of the joint owners, in accordance with the rules on transfer of results under the grant agreement.

2.4.2 Transfer of results

Transferring the ownership of their results to other partners is a possibility for those participating in Horizon 2020. However, it is fundamental that, whenever transferring the ownership of their results, participants follow the requirements established in their grant agreement:

- the transfer should be done through an agreement (preferably in written form), since beneficiaries must ensure that the obligations of the participant(s) under the grant agreement are passed on to the new owner and that this owner has the obligation to pass them on in any subsequent transfer;
- prior notice is given, at least 45 days before the intended transfer, to the other consortium partners that still have (or still may request) access rights to the results, with sufficient information about the new owner. The right to prior notice can be waived in the case of transfers to a specifically identified third party, which is usually done through the consortium agreement;
- participants are bound to formally request authorisation from the European Commission in advance, in cases of foreseen transfers to third parties established in a non-EU country not associated with Horizon 2020, including information on:
- the identification of the results at stake;
- the new owner and the planned or potential exploitation of the results, and
- the likely impact of the transfer or licence on EU competitiveness and its consistency with ethical principles and security considerations.

This notification must be done up to four years after the end of project.

3 Knowledge dissemination and management

3.1 Knowledge management and protection

Throughout the project, the consortium will continuously contribute to generating new knowledge that will be instrumental for shaping the expected project outcomes, several of which may qualify for Intellectual Property (IP) protection. For example, Selena owns the IP concerning the spray foam, SAES owns the IP for the low temperature adhesive and distributed getter technology for the vacuum glass while UCL has IP on the thermos-tunable coating which has discussed with AGC and TVITEC in terms of licensing. On the other side, it is an obligation and will also be the interest of the consortium to widely disseminate the proposed new methods and tools including through qualified scientific publications, open access to which will have to be provided. In order to comply with the obligation to disseminate results as well as open access rules and obligations, whilst safeguarding at the same time the rights of the consortium partners to protect their IP thus enhancing the chances of an effective commercial exploitation of the project's results, a strategy aimed at a proper management of the generated knowledge, perfectly coordinated with the communication and dissemination strategy, shall ensure that communication and dissemination activities are duly carried out, though without endangering the rights of the consortium partners to protect their IP.

Accordingly, a strategy and procedures for IP management shall constitute an integral part of the strategy and procedures for knowledge management. Indeed, whenever certain results are identified to be attractive for the future business opportunities of one or more of the partners, and protecting them is possible, reasonable and justified, the necessary steps to protect the associated IP shall be taken. IP protection measures (such as, but not limited to, patents, copyrights, trademarks, registered designs, design rights, databases, trade-secrets, confidentiality, and other forms of protection) may follow the procedures already in use by the concerned partner(s). However, according to the procedures defined among the consortium, the Innovation Manager (Oscar Casadei - FOCCHI) has to be informed at the earliest possible instance, about the intention by the concerned partner(s) to protect that IP. Hence, the Innovation Manager brings the IP protection intention at the attention of the Steering Committee. In order to secure the research as well as business interests of all partners involved, any issue that might arise from the IP protection initiative during the project will be dealt with by the General Assembly. In the case of jointly owned new IP, the procedures for IP protection, use and licensing will comply with the rules set in the Grant Agreement and also described in the Consortium Agreement. In addition to the above, issues related to IP protection will be handled within the Steering Committee on a regular basis, as well as within the General Assembly upon necessity. Each partner shall appoint a representative for IP related issues. Below the scheme of the management structure clarifies specific roles.

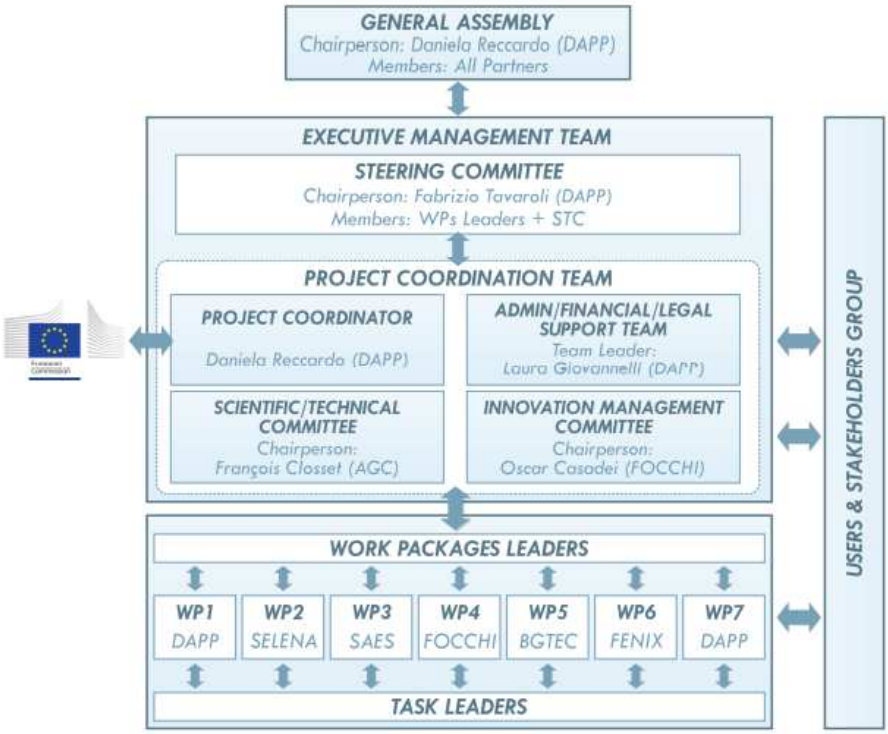


Figure 3.1: Management Structure

Each time certain results are identified to be worth IP protection, legal aspects are handled along with activities aimed at analyzing and providing support for filing the IP protection application. If necessary, commercial agreements are also drafted and agreed upon among the relevant actors. Hence, for any protectable IP the following steps are carried out:

- The concerned partner notifies the Innovation Manager about the technical contents it would aim to protect and the related ownership rights (including in case of joint ownership);
- Preliminary copyright, trademark, or patent searches are conducted by the concerned partner as well as the Innovation Manager, in order to check 'freedom-to-operate' with the scope of avoiding eventual infringements;
- Filing of the related IP protection application is then followed directly by the relevant partner(s), in accordance with the perimeter agreed with the other partners, as well as the perimeter of innovation and in order to maximize the potential for protection of the result.

Any filed application for protection of results will duly include information on the EU funding.

As for the figure above, within the project an Innovation Management Committee (IMC) has been also established to address IPR and licencing issues. The IMC is led by the Innovation Manager with long standing experience in managing IPR and licensing issues as well as communication in the construction sector. The IMC will involve a representative of each industrial partner and will liaise with the User & Stakeholders Group members to have a broad overview on exploitation perspectives and promptly address any non-technological barrier and risk. In addition a Data Management Plan has been developed in WP7 with the aim of enhancing and ensuring relevant project´s information transferability and taking into account the restrictions established by the consortium agreement. In this sense, the Plan has set the basis both for Dissemination Plan and Exploitation Plan.

3.2 Knowledge transfer by Universities to the industrial partners

In line with the rules laid down in the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities as well as the Model Grant Agreement the beneficiaries belonging to the category of universities or other public research organisations will consider knowledge transfer towards relevant stakeholders as a strategic mission to maximize the impact from this project. Accordingly, the universities belonging to the consortium will ensure that knowledge is appropriately transferred, via licensing to the private industrial and commercial organisations existing in the consortium or to potential spin-off companies, should these appear to be the best option for exploitation according to the final exploitation action plan. At the stage of project proposal it was anticipated that after project end Univpm will be involved in the design and calibration of the inline NDT quality control system for spandrel manufacturing by Focchi. UNIVPM and UULSTER will be contracted for component qualification against fire and other key regulatory aspects and voluntary schemes. UCL will get royalties on the licensing of the coating technology to AGC and TVITEC. In any case these aspects will be further investigated along the project.

3.3 Dissemination and Exploitation of Results[4]

In the context of Horizon 2020, dissemination refers to the public disclosure of results by any appropriate means, except those resulting from protecting or exploiting results. Scientific publications, general information on web sites, participation in conferences or trade fairs are some examples of dissemination activities.

According to the general model grant agreement, dissemination activities have to be undertaken starting from the beginning of the project. Under the leadership of FENIX and the supervision of the Coordinator, all partners have to proactively contribute to disseminate activities. To this end, roles and responsibilities of each partner will be clearly agreed upon at the beginning of the project through a dissemination plan and coordinated actions.

Prior to any dissemination activity other partners must/have to be consulted in order for them to exercise their right to object in the case where such dissemination could cause significant harm to their background or results. In particular, at least 45 days prior notice of any dissemination activity shall be given to the other beneficiaries concerned that within 30 days may object about the dissemination activity.

A novelty of Horizon 2020 is the requirement for participants to ensure open access to project results that is free of charge for any user, to all peer-reviewed scientific publications relating to its Horizon 2020 project's results. This does not mean that participants have the obligation to publish their results, nor does this affect their plans for exploitation. In fact, firstly participants must decide on the protection of their results and, once the decision is taken, consider if and when dissemination should be done through scientific publication

Participants receiving European Union funding must use their best efforts to take measures aiming at ensuring the exploitation of their results up to four years after the project. This means that participants must take steps to make sure the results they owned are used:

[4] https://www.iprhelpdesk.eu/Fact-Sheet-IP-Management-H2020-Project-Implementation-and-Conclusion

(a) in further research activities other than those covered by the project concerned, or

(b) in developing, creating and marketing a products or processes, or

(c) in creating and providing a services, or

(d) in standardisation activities.

The exploitation does not need necessarily to be done directly by the participants. Indirect exploitation can be performed by licensing the results or assigning them to third parties, in accordance with the requirements established in the grant agreement.

4 IPR protection strategy

Outcomes generated within the project must be properly protected, in order to guarantee their effective commercial exploitation.

Protection of results must be ensured in a reasonable and justified way for an appropriate period of time and in a suitable territory.

In particular, Intellectual Property protection measures can be distinguished in:

- Industrial property that can be protected through Patents, Designs and Trademarks
- Non-technical intellectual creations, e.g. literature or artistic ones including software, that can be protected through Copyrights

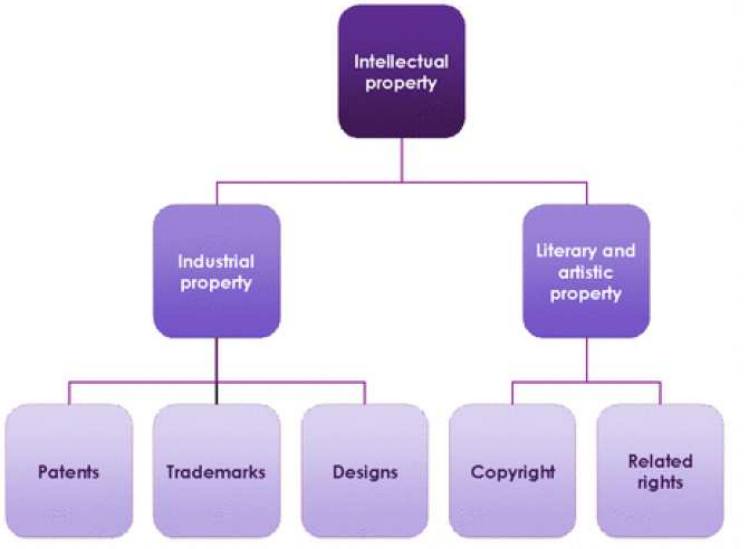


Figure 4.1: Different Intellectual Property Rights

The choice of the most suitable form of IP protection, as well as the duration and geographical coverage depends on the results at stake, but also on the business plans for their exploitation and on the legitimate interests of consortium partners.

Patents, trademarks, designs and copyrights are described further in the following section, while related rights are not covered in this manual since they deal with rights that benefit to performers (e.g. actors, musicians), producers of phonograms (CDs) and broadcasting organisations (TV, radio).

4.1 Formal and informal IP protection – Intellectual Property Rights

Formal IP is designed to provide incentives to innovate by providing a reward system that makes it easier for innovators to make profits if their innovation is successful by allowing them to exclude imitators for a finite period.

A number of common formal IPRs measures are listed in the table below[5]:

[5] U. Suthersanen, Incremental Inventions in Europe: A Legal and Economic Appraisal of Second Tier Patents, in Journal of Business Law, 2001, 319 ff

Patents	A patent is an industrial property right that protects a technical invention for a limited period of time (generally 20 years), giving the holder an exclusive right to prevent other from selling, making and using the patented invention. An invention to be patentable must fulfil three criteria: being new, innovative and be susceptible of industrial application. Patents are the most likely IP protection type to be used in the EENSULATE project.
Utility Models	A Utility Model is an exclusive right granted for an invention, which allows the right holder to prevent others from commercially using the protected invention, without his authorization and for a limited period of time (usually between 7 and 10 years, without the possibility of extension or renewal[6]). It may be any useful machine, implement, tools, product, composition, process, improvement or part of the same, that is of practical utility, novelty and industrial applicability. In practice, protection for utility models is often sought for innovations of a rather incremental character that may not meet the patentability criteria. Whether utility models would make sense and would be preferable to patents for some EENSULATE components have been evaluated among the EENSULATE project partners.
Industrial Design	Industrial Design is a type of protection dedicated to the intellectual creation used by designers; it is provided for a shape, configuration, surface pattern, colour, or line (or a combination of these), which, when applied to a functional product, produces or increases aesthetics, and improves the visual appearance of the design, be it a two-dimensional or a three-dimensional product. The subject of the design protection is the outwardly visible appearance of the product or its part, packaging or the ornamentation itself.[7] At this stage, it is not expected to apply for such type of protection under the EENSULATE project, so it is not further detailed in this document.
Copyrights	Copyrights protect non-technical intellectual creations; in practice, it refers to all of the rights owned by creators over their literary or artistic work. In order to be protected by copyright, a work must first have sufficient originality and, second, have taken form. Protection arises automatically giving the holder the exclusive right to control reproduction or adaptation. This type of protection could be envisaged in the context of the EENSULATE project, particularly if specific software or programming codes would be developed as support for the exploitation of other EENSULATE results.
Trademarks	Trademarks are distinctive signs identifying brands of products or services. Any sign that can be represented graphically may be registered as a trademark for a period of 10 years, with the option for indefinite renewal. If not already registered, the EENSULATE acronym and logo should most probably be registered as a trademark in view of reinforcing other IPR types.

Protection of the Intellectual Property generated within the EENSULATE Project can be ensured also through 'informal' methods, such as:

[7] https://yourstory.com/2015/07/what-is-industrial-design-protectiontheir-designs/

- Secrecy of information
- Restricted access to information
- Database and network protection
- Confidentiality
- Technical protection (imitation difficult)
- Components and system design protection

The previous list consists of conventional procedures which will be adopted by each Partner in the EENSULATE project and will be strictly followed also post-project to ensure that no information may leak outside of the Consortium.

Below, some examples of project outcomes that may be subjected to IPR protection are reported, and possible IPR protection measures for each of them are identified.

Subject Matter	Patent	Utility Model	Industrial Design	Copyright	Trademark	Confidential Information
Invention	X	X				X
Software	X			X		X
Scientific article				X		
Design of a product			X	X	X	
Name of a product, service /project					X	
Know - How						X
Website			X	X	X	

4.2 IPR Protection procedure

In order to ensure an adequate share in the protection of joint efforts it is recommended to notify whenever an innovation or any foreground is generated, as well as to ensure that the foreground sharing is ascertained and agreed among the partners creating it. This should occur on a case-by-case basis and under the supervision of the project Steering Committee (SC), in the person of the project coordinator, and in particular of the Innovation Management Committee, in the person of the Innovation Manager.

Thus, according to the protection measures that have been anticipated in Paragraph 3.1, each partner has to inform, at the earliest possible instance, the Innovation Manager (Oscar Casadei – FOCCHI) about the technical contents it would aim to protect and the related ownership rights (including in case of joint ownership). In this case, it is considered a good practice to consult with other partners involved, before deciding whether and how to protect a specific result.

Any Partner intending to apply for any of the protection measures listed in the previous section, acknowledges the Coordinator of its intention. The Coordinator then has to inform the project Steering Committee (SC) and the Innovation Management Committee (IMC). The acknowledgement of the

intention to protect the generated foreground has to be accompanied by a synthetic description of the foreground subject of the intention for IPR protection by filling the template reported in ANNEX 1.

The template requires the following fields to be filled:

- Subject
- Description
- Type of protection (Patent, Trademark, Industrial Design, Copyright, Other)
- Protection Rationale
- Potential Market
- Scientific Responsible
- Keywords
- Work-package(s)
- Partners involved

The *Subject* field enables a unique identification of the innovation (possible patentable idea): the subject should be well suited to enable a quick retrieval of the different claimed innovations. Partners are encouraged to describe in the field description the main terms of the innovation, according to simple and clear terms precisely referring to the activities performed in the project.

The *Keyword* field is optional; however, it is strongly recommended to provide at least one keyword for a unique identification of the innovation. This enables the Coordinator and the Innovation Manager to better perform the work of review and evaluation of the effective potentiality of the innovation.

The different possible protection mechanisms (more than one choice is possible) can be indicated in the field *Type of Protection*. This is only a suggestion and a preference for the evaluator, but will not constitute a restriction for the evaluation activity.

Other fields are related to the *Protection rationale* and the *Potential market*. The latter enables the partner to identify the possible potential market of the innovation. This can be useful both for the definition of the foreseen economic impact and for achieving a rough estimate of the potential geographical market penetration. Such information could be relevant for the definition of places where it can be crucial to protect the claimed innovation.

Specific fields to be filled have been foreseen in order to identify the *Work package* in which the innovation has been developed and the *Partners involved* in the new innovation.

The description shall be sufficiently detailed to allow the Steering Committee (SC) to evaluate whether the application for protection of the IPR may endanger other Partners of the Consortium, though it shall be sufficiently general not to disclose too much information related to the subject. In any case, the Steering Committee (SC) shall deem that the application for IPR protection may have an impact on other Partners' activities or businesses, the control body shall be entitled to ask for more details on the matter of the application and eventually involve all the interested Parties in a discussion to analyse the situation.

The Coordinator shall track all acknowledgements of partners expressing the intention for IPR protection as well as the date of the acknowledgement. The intention for IPR application shall be archived. This will be useful to uniquely identify the partner's ownership and attribute a clearly defined date to the claimed invention. This, besides the short description of the invention, will provide the Steering Committee (SC) with archive information to be referred to in the case of IPR related disputes between partners.

The following table shall provide an overview list of applications for patents, trademarks, registered designs, etc and it will be periodically updated throughout the duration of the project, according to partners' feedback.

EENSULATE: List of applications for patents, trademarks, registered designs, etc.			
Type of IP Rights	Application reference(s) (e.g. EP123456)	Subject or title of application	Applicant(s) (as on the application)
Patent			

4.3 Patent application

There are different routes to patent protection and the best route will depend on the invention and the markets where the EENSULATE results would be exploited.

National patents

If the intention is to apply for a patent in just a few European countries, it may be better to choose the national route and file the specific application at the IP offices in the countries for which protection is sought.

Patent law in the European Patent Organisation (EPO) member states has been extensively harmonised with the European Patent Convention (EPC) in terms of patentability requirements. However, the national route generally leads to national rights that confer protection of differing extent.

European patents

The European Patent Convention (EPC) is a multilateral treaty instituting the European Patent Organisation (EPO) and providing an autonomous legal system according to which European patents are granted.

The fees for applying for a patent at the EPO are, however, higher than those that are charged by the national patent offices. The fees at the EPO do not cover the actual grant of patents by individual countries, so one has to allow for additional official fees following allowance when the patent is validated in those countries in which the patent wish to be in force.

Based on the fees related to the European grant procedure, costs for representation by a single agent and cost of conducting the proceedings in a single language, a European patent costs is as much as about three or four national patents.

In other words, if a partner wish to gain protection in more than two or three of the countries that are members of the European Patent Convention, it will probably be cheaper to go for the European Patent route. If a partner want just two countries, then separate national applications will probably be cheaper. If a partner would like patent protection in three countries then a very careful analysis would need to be performed.

European or International filing

The Patent Cooperation Treaty (PCT) is an international patent law treaty that provides unified procedure for filing patent applications to protect inventions in each of its 148 Contracting States.[8] A patent application filed under the PCT is called an international application, or PCT application.

[8] http://www.wipo.int/pct/en/pct_contracting_states.html

A PCT application, which establishes a filing date in all contracting states, must be followed up with the step of entering into national or regional phases to proceed towards grant of one or more patents. The PCT procedure essentially leads to a standard national or regional patent application, which may be granted or rejected according to applicable law, in each jurisdiction in which a patent is desired.

If a partner decides to apply for a European patent, the choice would be to follow the direct European route or the international PCT procedure.

Due to the European scope of the EENSULATE project, European patent applications are the most likely to happen, reason why this route is described hereafter.

A European patent application consists in[9]:

- A request for grant (obligatory), preferably on EPO form 1001
- A description of the invention (obligatory)
- Claims
- Drawings (if any)
- An abstract

According to the Horizon 2020 Rules for Participation and models grant agreement, project results belong to the participant generating them.

9

http://documents.epo.org/projects/babylon/eponet.nsf/0/63a9e7299c8e2feec12577d8004beacd/$FILE/poster_grant_procedure_en.pdf

5 EENSULATE Exploitable Results IPR protection

Along the project, in parallel to the Characterization Tables development, the best option for protecting the ERs IPR was chosen and subsequent actions taken in agreement with the partner responsible intention.

Table 5.1 below provides an overview of the Exploitable Results, the related Responsible, their intention outlined within the Characterization Table and the actions agreed together with RINA, as IPR manager.

Table 5.1: Overview of the Exploitable Results

N°	Exploitable result	Lead partner	Lead partner IPR protection intention	Agreement on IPR protection actions
1	Highly insulating environmentally friendly bi-components foam	SELENA	In M36, SELENA will file a patent	Template filled in by RINA and checked by SELENA. Will to patent.
2	Thermo-tunable coating	UCL	A large-scale prototype will be required first, as proof-of-concept. Due to prior publications, protection through patent is unlikely.	Wait along the project and see if info is enough for patenting later. Updates will be provided in the final version of the document
3	Design manufacture and installation of high-insulation façade	FOCCHI	The aim is to protect the knowledge regarding the design. No steps in the direction were taken yet, but in the future there is an estimation of a proper result protection.	Template filled in by RINA and checked by FOCCHI. Double possibility to protect the EENSULATE module design as “utility model” and the process for foam application as “patent”.
4	Testing protocols for durability assessment of glazed surfaces	UNIVPM	New testing guidelines will be kept confidential and restricted to the project partners. UNVIPM will evaluate the opportunity to license some of the testing protocols.	No activities foreseen so far. Updates will be provided in the final version of the document.
5	Innovative sealant for vacuum insulated glass	SAES	SEAS will protect the results with a patent application as soon as the results will meet the requirements.	Template for preliminary patent analysis prepared by RINA and checked by SAES. Will to patent
6	Innovative getter for vacuum insulated glass	SAES	SEAS will protect the results with a patent application as soon as the results will meet the requirements	Template for preliminary patent analysis prepared by RINA and checked by SAES. Will to patent
7	Window framing solution compatible with	BGTEC	To be defined. No measurements were taken yet	Wait along the project and see if info is enough for patenting later. Updates will be provided in the final

	EENSULATE glass			version of the document.
8	EENSULATE mono-component foam for windows application	SELENA	A patent request will be filed during M36 alongside other patents requests in the project.	Template filled in by SELENA. Will to patent.

Given the above table, RINA preliminary filled in the Evaluation Template for potential patentable idea for the following results aiming to file a patent:

- ER1: Highly insulating environmentally friendly bi-components foam
- ER3: Design manufacture and installation of high-insulation façade
- ER5: Innovative sealant for vacuum insulated glass
- ER6: Innovative getter for vacuum insulated glass
- ER8: EENSULATE mono-component foam for windows application

Responsible partners checked and finalized the templates (reported in Annex 2), paying particular attention to the keywords to be used for the preliminary patent analysis.

Paragraphs below provide the preliminary patent analysis for the above ERs, detailing the following aspects:

- an overview of the current patents scenario based on the keywords used
- an overview of the geographical location of patents
- an overview of the main applicants
- main conclusions

5.1 Patent mapping analysis

Patent analysis is a unique management tool for addressing the strategic management of the firm's technology and product or service development process. Translating patent data into competitive intelligence allows the firm to gauge its current technical competitiveness, to forecast technological trends, to plan for potential competition based on new technologies[10].

In this section is presented the preliminary patents analysis. The analysis has been done out exploiting Derwent Innovation (website: www.derwentinnovation.com) database. Derwent Innovation is unrivalled as a search and analytics platform for IP and business-critical decision making. It is powered by best-in-class technology including artificial intelligence, together with unparalleled expertise in patent data and IP workflows built in. It is underpinned by global, standardized patent data including bibliographic data, full text documents, drawings, Derwent Word Patent Index (DWPI) and Derwent Patent Citation Index (DPCI). The tool offers patent and literature collections.

In the paragraph below, the preliminary patent analysis for the selected result is provided, with the following:

[10] Fleisher, Craig S. and Babette E. Bensoussan. Strategic and Competitive Analysis: Methods and Techniques for Analyzing Business Competition

- **Scenario analysis** related to the identification of patents temporal trend submission, patent publications countries as well as trend of the main applicants. The queries adopted have been specified and agreed with the ER responsible.
- **Punctual analysis** allowing the identification of interesting technological solutions, tools and methods that could represent hints to the further project technological development and suggest ideas for further patents development. In this case, the most relevant patents have been analyzed in detail with the support of the Derwent Innovation suite.

For each of them a table summarizing main contents is reported, providing the following information:

- Title;
- Status (dead, alive or indeterminate)
- Title DWPI (Revised Title)
- Publication number
- DWPI Assignee
- Publication year
- Current IPC(s)
- Abstract, Novelty, Use, Technology Focus, Advantage and Drawing Description (if available)
- Drawing

5.1.1 ER1: Highly insulating environmentally friendly bi-components foam + ER 8: EENSULATE mono-component foam for windows application

Since ER1 and ER8 concern a foam that differentiates only for its composition, a preliminary patent analysis has been performed starting from 2008 up to day and using a generic query referring to a nanocomposite, polymeric and insulating foam to be used in building or curtain wall. In particular the query used to obtain a patent dataset is "(((nanocomposite* OR insulat* OR polymer*) ADJ foam) AND (building OR (curtain ADJ wall)))".

The query results in a total of 1725 patents selected (corresponding to 686 INPADOC families). As it can be noticed from the following graphs in the last 10 years (2008-2018) there's been a positive temporal trend showing a peak of interest in 2014. In particular, there has been great interest towards patent applications from countries as China, US and Europe. Main players are DOW Global Technologies, BASF and Saint-Gobain, who submitted 473, 90 and 86 patents respectively.

In the following the main results of the scenario analysis it's been reported.

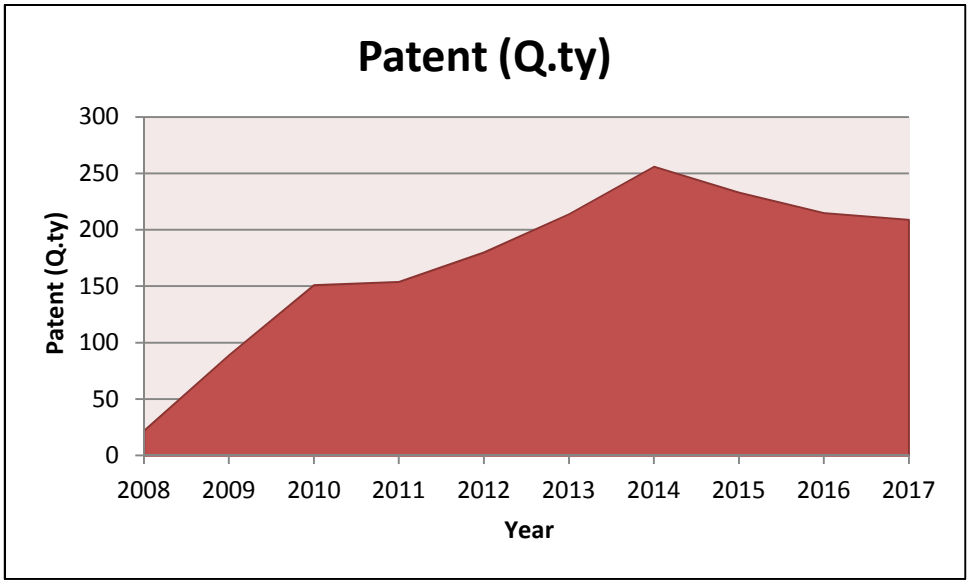


Figure 5.1: Patent temporal trend (2008-2018)

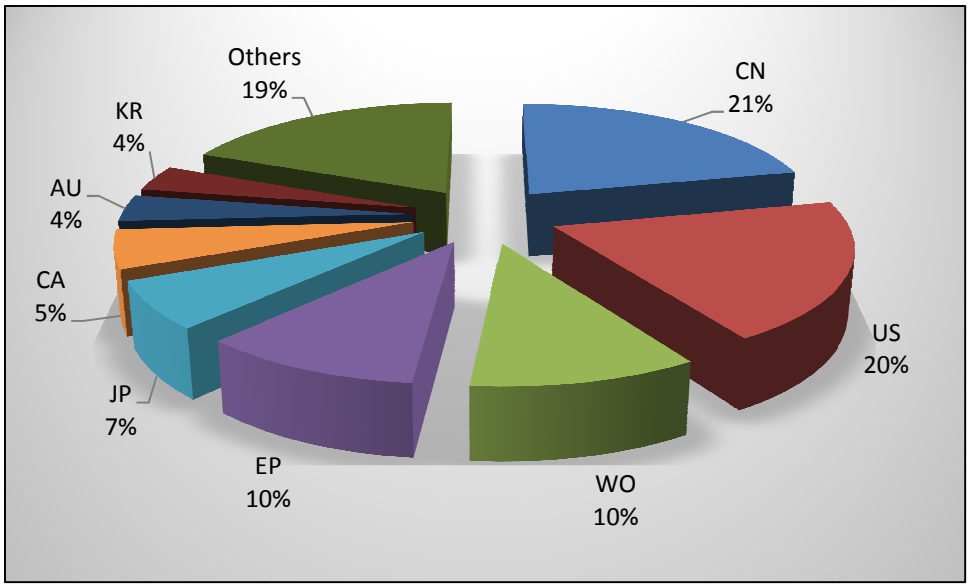


Figure 5.2: Patent Publication Countries

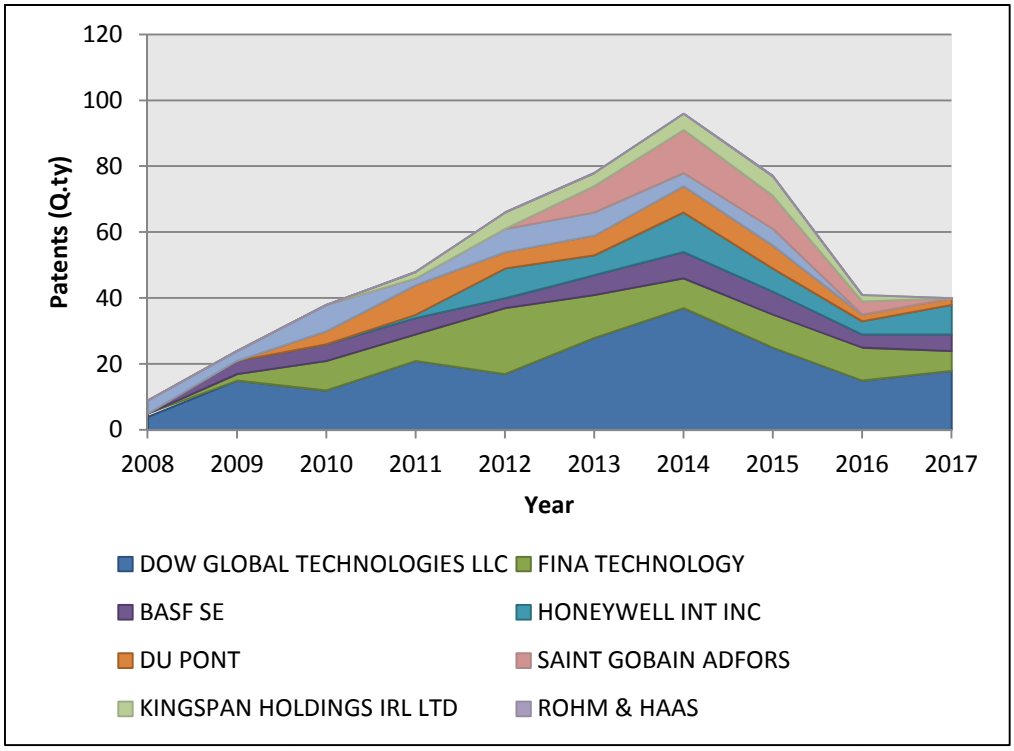


Figure 5.3: Trend of the main applicants

In order to detail the patent analysis according to the different composition of the foam, a second more detailed patent search has been performed, based on the previous query and adding specific keywords:

"((bi-component OR two-component) ADJ foam) to investigate the patent scenario for the result ER1

"((mono-component OR one-component) ADJ foam)" to investigate the patent scenario for the result ER8.

In the first case, the query results in a total of 53 patents selected (corresponding to 21 INPADOC families). Tables below provide the most relevant patents analyzed.

Table 5.2: CN104761698A

FENGJING CHINA BUILDING MATERIAL GROUP	✓ Alive

Title DWPI:

Portable two-component polyurethane foam sealant comprises polyether polyol or polyester polyols, castor oil, plasticizer, triethanolamine, foam stabilizing agent, catalyst, foaming agent and polyisocyanate

Publication number (Kind Code):

CN104761698A

Inventor(s):

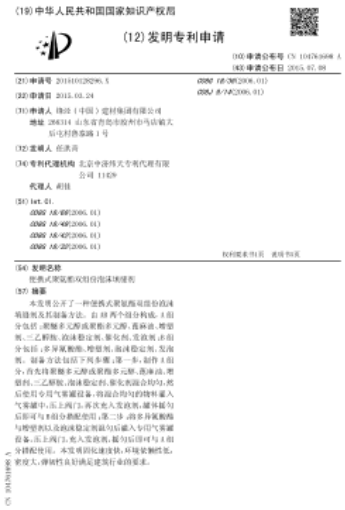
REN H

Publication Date:

2015-07-08

Current IPC:

C08G 18/66; C08G 18/32; C08G 18/36; C08G 18/42; C08G 18/48; C08J 9/14



(19)中华人民共和国国家知识产权局

(12)发明专利申请

(54)发明名称

(57)摘要

Abstract

Novelty

Portable two-component polyurethane foam sealant comprises component A comprising 20-60 pts. wt. polyether polyol or polyester polyols, 0-10 pts. wt. castor oil, 0-50 pts. wt. plasticizer, 5-10 pts. wt. triethanolamine, 0-1 pts. wt. foam stabilizing agent, 0.2-2 pts. wt. catalyst, 5-20 pts. wt. foaming agent and 0-1 pts. wt. water; and component B comprising 20-80 pts. wt. polyisocyanate, 0-60 pts. wt. plasticizer, 0-1 pts. wt. foam stabilizing agent and 5-20 pts. wt. foaming agent.

Detailed Description:

An INDEPENDENT CLAIM is also included for preparing foam sealant, comprising (i) preparing component A by uniformly mixing all the above mentioned raw materials, and adding the materials into an aaerosol canister device, and uniformly mixing by pouring aerosol material into a tank body, and pressing a valve, re-filling foaming agent again, and uniformly shaking the tank body; and (ii) preparing component B by mixing polyisocyanate with plasticizer and foam stabilizing agent by pouring into aerosol cans, pressing valve, filling foaming agent, and shaking by adding component A.

Use

Used as portable two-component polyurethane foam sealant.

Advantage

The foam sealant has rapid curing rate, high density, good toughness, and thus it meets the requirements of construction industry; and is economical.

Technology Focus:

INORGANIC CHEMISTRY- Preferred Components: The castor oil has functionality of 2-4, and hydroxy value of 100-200 mg potassium hydroxide/g. The triethanolamine has three alcoholic hydroxy groups. The plasticizer is paraffin or phosphate. The foam stabilizer is common rigid polyurethane foam and silicone surfactant.

ORGANIC CHEMISTRY- Preferred Components: The catalyst is 1-3 pts. wt. bis-dimethylamino ethyl ether and diethylene glycol mixed solution, in a ratio of 70%:30%, or 0.2-1 pts. wt. dibutyltin dilaurate. The polyisocyanate is multi-phenyl methane diisocyanate or multi-phenyl methane polyisocyanates. The foaming agent is propane and butane (liquefied petroleum gas), dimethyl ether, 1, 1, 2, 2-tetrafluoroethane (HFC-134a), dichlorodifluoromethane or 1, 3, 3, 3-tetrafluoropropene (HFO-1234ze).

POLYMERS- Preferred Components: The functional value of polyester polyols or polyether polyols, is 2-4, and has hydroxy value of 100-800 mg potassium hydroxide/g.

Table 5.3: CN103242506A

TIANJIN DINGXIN FIRE-PROOF MATERIAL TECH	∅ Dead

Title DWPI:

Bi-component foaming agent comprises polyether polyol, ethylene glycol, aluminum silicate, catalyst and multi-isocyanate ester

Publication number (Kind Code):

CN103242506A

Inventor(s):

ZHAO L

Publication Date:

2013-08-14

Current IPC:

C08G 18/66; C08G 18/32; C08G 18/48; C08K 3/34; C09J 175/08


(19)中华人民共和国国家知识产权局

(12)发明专利申请

(54)发明名称

一种双组分发泡剂及其制备方法

(57)摘要

本发明提供一种双组分发泡剂及其制备方法，由包括A和B两种组分制成，A和B组分的重量份数比为1:1-3:1，A组分由包括如下重量份数的原料制成：聚醚多元醇 30-50 份，乙二醇 20-50 份，硅酸铝 25-30 份，催化剂 1-3 份，B组分为异氰基酸酯。A组分的制备方法如下：向容器中加入聚醚多元醇，在真空环境下脱水，依次加入乙二醇、硅酸铝和催化剂，均匀搅拌，静置 24 小时后，灌装到密闭容器内，得到成品A组分。本发明的双组分发泡剂是通过A和B组分的配合使用，发泡剂的发气量和反应速度可控，使用场所通过广泛，A和B组分分开封装，存储、运输方便，安全，发泡分解温度高，反应速度快，无有毒气体释放，经济简单，成本低。

Abstract

Novelty

A bi-component foaming agent comprises component A and component B at weight ratio of 1:1-3:1. Component A comprises 30-50 pts. wt. polyether polyol, 20-50 pts. wt. ethylene glycol, 25-30 pts. wt. aluminum silicate and 1-3 pts. wt. catalyst. Component B is multi-isocyanate ester.

Detailed Description:

An INDEPENDENT CLAIM is included for preparation of bi-component foaming agent comprising adding polyether polyol into container, vacuum-dehydrating for 1-3 hours, adding ethylene glycol and catalyst, uniformly stirring for 3-5 hours at stirring speed of 50-150 revolutions/minute, standing for 24 hours and filling into sealed container.

Use

Bi-component foaming agent.

Advantage

The foaming agent is convenient and safe to transport, and has high decomposition temperature. The simple method has fast reaction speed, low cost and does not release toxic gas.

Technology Focus:

ORGANIC CHEMISTRY- Preferred Components: The catalyst is ammonium polyphosphate and/or polyamide.

In the second case (“((mono-component OR one-component) ADJ foam)”), the query results in a total of 82 patents selected (corresponding to 21 INPADOC families).
Tables below provide the most relevant patents analyzed.

Table 5.4: WO2017058559A1

DOW GLOBAL TECHNOLOGIES LLC	✓ Alive

Title DWPI:

One-component foam formulation used as sealant for sealing fenestration openings, comprises prepolymer which is reaction product of polymeric polyol, chain extender molecules and polyisocyanate, blowing agent, and optionally additives

Publication number (Kind Code):

WO2017058559A1

Inventor(s):

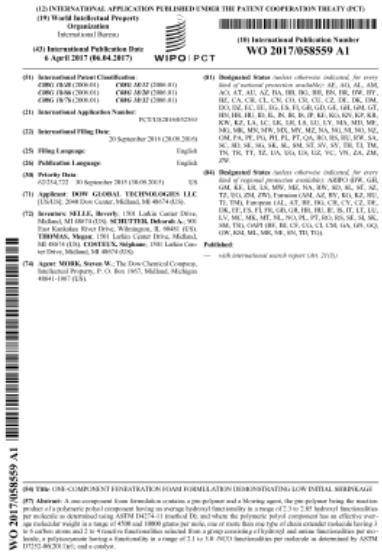
COSTEUX S; SCHUTTER D A; SELLE B; THOMAS M

Publication Date:

2017-04-06

Current IPC:

C08G 18/48; C08G 18/12; C08G 18/20; C08G 18/32; C08G 18/66; C08G 18/76


(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau

(43) International Publication Date 6 April 2017 (06.04.2017)

WIPO | PCT

(10) International Publication Number WO 2017/058559 A1

WO 2017/058559 A1

(54) Title: ONE-COMPONENT FENESTRATION FOAM FORMULATION DEMONSTRATING LOW INITIAL SHRINKAGE

(57) Abstract:

Abstract

Novelty

One-component foam formulation comprises a prepolymer, a blowing agent, and optionally additives. The prepolymer is reaction product of a polymeric polyol component comprising blend of diol and triol, a chain extender molecules, a polyisocyanate with 2.1-3.0 isocyanate functionality per molecule measured according to ASTM D7252-06(2011) , and a catalyst. The polymeric polyol component has an average hydroxyl functionality of 2.3-2.85 per molecule measured according to ASTM D4274-11, and an average molecular weight (Mw) of 4500-10000 g/mol.

Detailed Description:

One-component foam formulation comprises a prepolymer, a blowing agent, and optionally additives. The prepolymer is reaction product of a polymeric polyol component comprising blend of diol and triol, a chain extender molecule, a polyisocyanate with 2.1-3.0 isocyanate functionality per molecule measured according to ASTM D7252-06(2011), and a catalyst. The polymeric polyol component has an average hydroxyl functionality of 2.3-2.85 per molecule measured according to ASTM D4274-11 , and an average molecular weight (Mw) of 4500-10000 g/mol calculated using the formula: Mw = (η)i wi Mi /(η)i wi , where i is 1-n. The chain extender has 3-6 carbon atoms, and 2-4 reactive functionalities chosen from hydroxyl and amine functionalities per molecule. The polymeric polyol component has 40-85 mol% reactive functionality with respect to total hydroxyl and amine functionalities. The concentration of polyisocyanate with respect to polymeric polyol component and chain extender is 12-20 wt.% based on total weight of isocyanate and polyol in formulation measured by ASTM D2572-97(2010). The foam formulation is free of toluene diisocyanate and reaction products of toluene diisocyanate.

Use

One-component foam formulation is used as sealant for sealing fenestration openings.

Advantage

The one-component foam formulation has low foaming pressure and low shrinkage with respect to sealed fenestration openings.

Technology Focus:

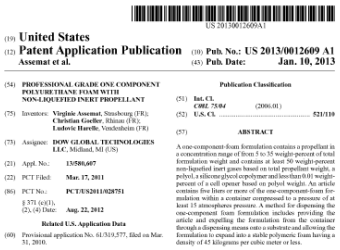
ORGANIC CHEMISTRY- Preferred Properties: The diol has a number average molecular weight of 6000-12000 g/mol measured by gel permeation chromatography. The triol has number average molecular weight of 500-6000 g/mol measured by gel permeation chromatography. Preferred Composition: The concentration of triol is 5-35 wt.% based on total weight of the diol and triol. The concentration of chain extender molecules is 0.5-5 pts. wt. based on 100 pts. wt. polymeric polyol component. The concentration of blowing agent is 10-18 wt.% with respect to total weight of the one-component foam formulation. The foam formulation further comprises silicone surfactant and flame retardant. Preferred Component: The functionality of chain extender molecules are hydroxyl. The chain extender molecules are chosen from at least one of butanediol, pentanediol, and glycerol. The catalyst is 2, 2'-dimorpholinodiethylether.

Table 5.5: US20130012609A1

DOW GLOBAL TECHNOLOGIES INC	! Indetermined

Title DWPI:

One-component-foam formulation for disposing polymeric foam adhesive, sealant and/or insulating material comprises isocyanate compound, polyol, amine catalyst, emulsifier, cell opener, surfactant and non-liquefied inert gases propellant



US 20130012609A1

(19) United States
(12) Patent Application Publication
Assemat et al.

(10) Pub. No.: US 2013/0012609 A1
(43) Pub. Date: Jan. 10, 2013

(54) PROFESSIONAL GRADE ONE COMPONENT POLYURETHANE FOAM WITH NON-LIQUEFIED INERT PROPELLANT

(75) Inventors: Virginie Assemat, Strasbourg (FR); Christian Goeller, Rhinau (FR); Ludovic Harelle, Vendenheim (FR)

(73) Assignee: DOW GLOBAL TECHNOLOGIES LLC, Midland, MI (US)

(21) Appl. No.: 13/580,607

(22) PCT Filed: Mar. 17, 2011

(86) PCT No.: PCT/US2011/028751

§ 371 (c)(1), (2), (4) Date: Aug. 22, 2012

Related U.S. Application Data

(60) Provisional application No. 61/319,577, filed on Mar. 31, 2010.

Publication Classification

(51) Int. Cl.
C08L 75/04 (2006.01)

(52) U.S. Cl. 521/110

(57) ABSTRACT

A one-component-foam formulation contains a propellant in a concentration range of from 5 to 35 weight-percent of total formulation weight and contains at least 50 weight-percent non-liquefied inert gases based on total propellant weight, a polyol, a silicone glycol copolymer and less than 0.01 weight-percent of a cell opener based on polyol weight. An article contains five liters or more of the one-component-foam formulation within a container compressed to a pressure of at least 15 atmospheres pressure. A method for dispensing the one-component foam formulation includes providing the article and expelling the formulation from the container through a dispensing means onto a substrate and allowing the formulation to expand into a stable polymeric foam having a density of 45 kilograms per cubic meter or less.

Publication number (Kind Code):

US20130012609A1

Inventor(s):

ASSEMAT V; GOELLER C; HARELLE L

Publication Date:

2013-01-10

Current IPC:

C08L 75/04

Abstract

Novelty

A one-component-foam formulation comprises an isocyanate compound, polyol, an amine catalyst, an emulsifier, a cell opener (greater than 0 to less than 0.01 wt.% based on the polyol), surfactant and propellant (5 to 35 wt.%). The propellant comprises non-liquefied inert gases (at least 50 wt.%). The surfactant is a silicone glycol copolymer.

Detailed Description:

INDEPENDENT CLAIMS are included for the following:an article comprising the one-component-foam formulation (≥ 5 liters) within a container compressed to a pressure of at least 15 atmospheres pressure; and dispensing the one-component-foam formulation involving providing the article and expelling the one component foam formulation from the container through a dispensing means onto a substrate and allowing the one-component-foam formulation to expand into a stable polymeric foam having a density of ≤ 45 kg/cubic meter.

Use

As a one-component polyurethane foam formulation used in a pressurized container or article (claimed) for disposing polymeric foam adhesives, sealants and/or insulating materials.

Advantage

The one-component-foam formulation can be provided in a professional scale pressure vessel that uses a non-liquefied inert propellant at pressures of ≥ 20 atmospheres. The formulation produces a foam bead that has no visible shrinkage and that has a similar density, visual appearance and cell structure homogeneity as one-component-foam produced from conventional propellants, thus solves the packaging problems associated with dispensing the formulation at an acceptable flow rate over a temperature of 5-35° C.

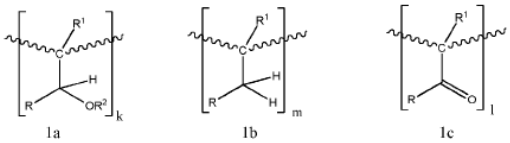
Technology Focus:

INORGANIC CHEMISTRY- Preferred Components: The propellant is entirely non-liquefied inert gas selected from carbon dioxide and nitrogen.

POLYMERS- Preferred Composition: The one-component-foam formulation comprises (wt.%): emulsifier (0-2) and surfactant (0-2). Preferred article: The article further comprises a hose that has an inside diameter of at least 9.5 mm through which the one-component-foam formulation can be expelled from the container. Preferred Components: The cell opener is a polydimethyl siloxane. The emulsifier is an organosilicon. Preferred Method: In the method, one-component-foam formulation is expelled from the container through a tube or hose having an internal diameter of at least 9.5 mm so as to form a foam bead; and the one-component-foam is expelled at a rate of 100-500 g per ten seconds at 0-50° C.

Table 5.6: WO2017005760A1

EVONIK DEGUSSA GMBH	✓ Alive
Title DWPI: Composition useful e.g. for producing polyurethane foams, preferably polyurethane hard foam, comprises e.g. isocyanate component and hydroxy-functional compound obtained by partial or complete hydrogenation of ketone-aldehyde resins	
Publication number (Kind Code): WO2017005760A1	
Inventor(s): GLOS M	
Publication Date: 2017-01-12	
Current IPC: C08G 18/54; C08G 18/18; C08G 18/22; C08G 18/24; C08G 18/40; C08G 18/42; C08G 18/48	



Abstract

Novelty

Composition comprises at least one isocyanate component, at least one hydroxy-functional compound (OHV) which is obtained by partial or complete hydrogenation of ketone-aldehyde resins, and optionally a polyol component, a catalyst which catalyzes the formation of a urethane or isocyanurate bond and blowing agent. The OH-functional compound contains at least one alkoxy substituted hydrocarbon structural element (Ia) and optionally at least one hydrocarbon structural element (Ib) and/or at least one carbonyl substituted hydrocarbon structural element (Ic).

Detailed Description:

Composition comprises at least one isocyanate component, at least one OH-functional compound (OHV) which is obtained by partial or complete hydrogenation of ketone-aldehyde resins, and optionally a polyol component, a catalyst which catalyzes the formation of a urethane or isocyanurate bond and blowing agent. The OH-functional compound contains at least one alkoxy substituted hydrocarbon structural element of formula (Ia) and optionally at least one hydrocarbon structural element of formula (Ib) and/or at least one carbonyl substituted hydrocarbon structural element of formula (Ic).R=6-14C aromatic hydrocarbon residue or 1-12C (cyclo)aliphatic hydrocarbon residue (both are optionally be substituted);R1=H or CH2 OH;R2=H or alkylene oxide moiety of formula (-(CH2 -CH(R')O-)y -H) (II);R'=H, methyl, ethyl or phenyl;y=1-50;k=2-15, preferably 4-11;m=0-13, preferably 0-9;l=0-2; andk+l+m=5-15, preferably 5-12.Provided that k is greater than m. INDEPENDENT CLAIMS are also included for:producing polyurethane foam, preferably polyurethane hard foam, comprising reacting at least one polyol component with at least one isocyanate component in the presence of at least one OHV which is obtained by the partial or complete hydrogenation of ketone-aldehyde resins; polyurethane foam obtained by the above method; and use of OHV which is obtained by the partial or complete hydrogenation of ketone-aldehyde resins, for producing polyurethane foam, preferably polyurethane foam rigid foams.

Use

The composition is useful for producing polyurethane foams, preferably polyurethane hard foam: as insulation material in refrigeration technology, refrigerated furniture and construction-, automotive-, shipbuilding- and/or electronics sector; and as insulation panels, spray foam and one-component foam. The OH-functional compound is useful as a foam-stabilizing component in producing polyurethane foams (all claimed).

Advantage

The OH-functional compound reduces shrinkage, improves fire resistance of polyurethane foam, preferably flame resistance and/or reduces flame height (claimed).

Technology Focus:

POLYMERS- Preferred Components: Preferred Components: The OHV is present in total amount in a mass fraction of 0.5-100 parts, preferably 3-50 parts, based on 100 parts of the polyol component. The polyurethane foam has space weight of 5-750 kg/m3 and closed cell content of greater than 80%, preferably greater than 90%.

5.1.2 ER3: Design manufacture and installation of high-insulation façade

In order to get a preliminary rough result of the patent analysis of this result, the research has been performed starting from 2008 up to day.

The query used to obtain a patent dataset referring to processes able to apply foam into insulated curtain wall units is *"((insulat* ADJ foam) AND (application* OR process* OR test*) AND ((building OR (curtain ADJ wall) OR (glass ADJ façade)))"*.

The query results in a total of 423 patents selected (corresponding to 185 INPADOC families). As it can be noticed from the following graphs in the last 10 years (2008-2018) there's been a positive temporal trend showing a peak of interest in 2015 and again a growing trend in 2017. In particular, there has been great interest towards patent applications from countries as China, US and Europe. Main players are BASF, Huntsman Int LLC and Owens Corning, who submitted 50, 44 and 42 patents respectively.

In the following the main results of the scenario analysis it's been reported.

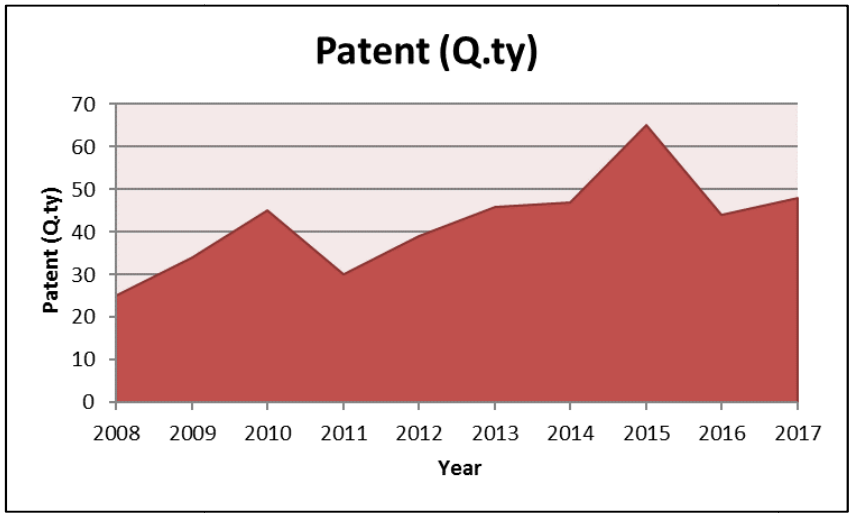


Figure 5.4: Patent temporal trend (2008-2018)

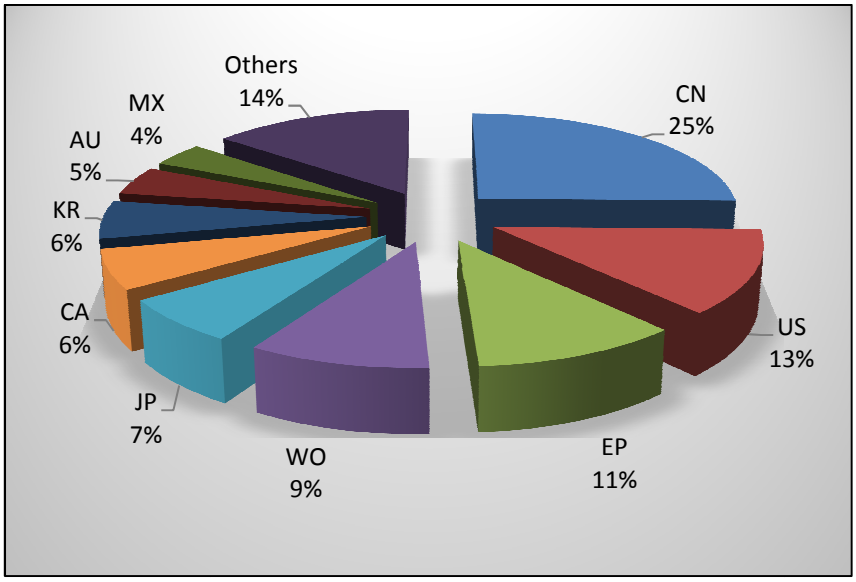


Figure 5.5: Patent Publication Countries

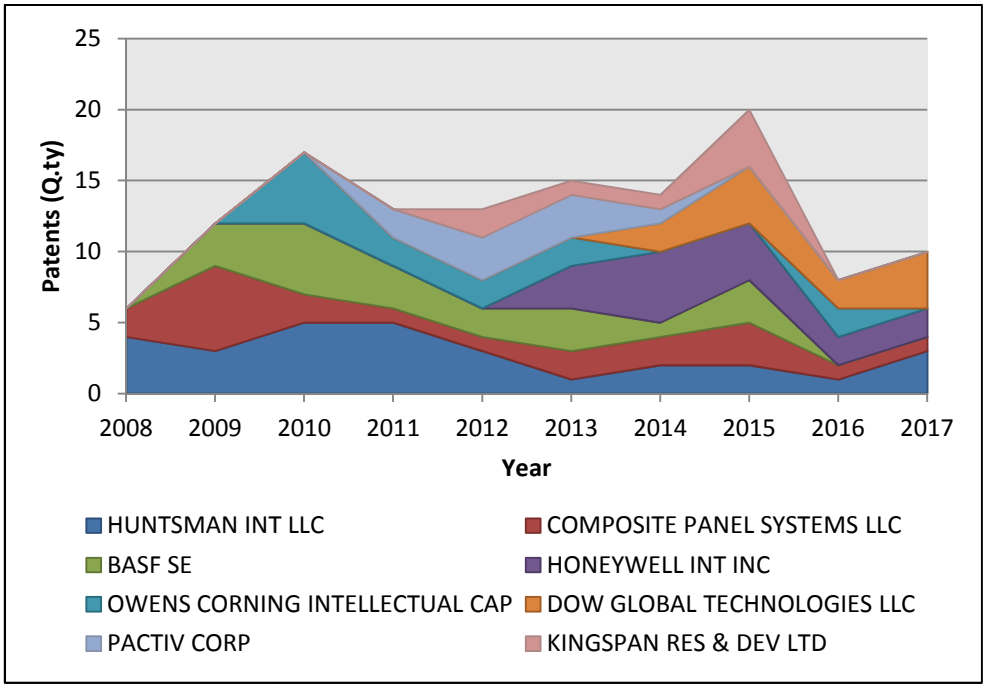
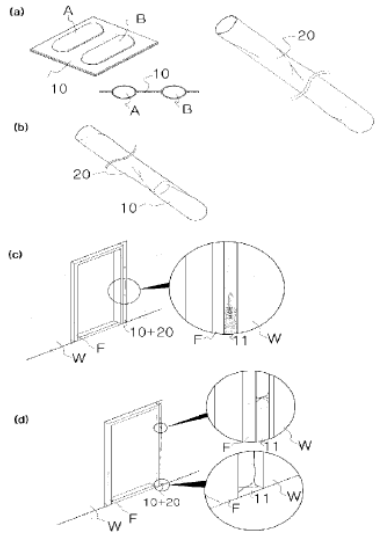


Figure 5.6: Trend of the main applicants

Tables below provide the most relevant patents analyzed.

Table 5.7: WO2008038933 (A1)

ENVITEC ENG INC (ENVI-N)	∅ Dead
Title DWPI: Pointing method for filling foam insulator in gap between members of building e.g. wall body and frame of window and door using two-component foam insulator involves mixing respective solutions of two-component foam insulator in porous tube	
Publication number (Kind Code): WO2008038933A1	
Inventor(s): KUM S W; YU D H	
Publication Date: 2008-04-03	
Current IPC: E04B 1/78	

Abstract

Novelty

Pointing method includes steps of preparing two-component foam insulator (10) of which each solution (A, B) is separately packaged, and a porous tube (20) which is formed to be opened at one end and closed at the other end, mixing the respective solutions of two-component foam insulator in the tube, and putting the tube in which respective solutions of two-component foam insulator are mixed, into the gap of building to perform the foaming. Tube is made of at least one material selected from synthetic resin vinyl, fiber fabric, and paper.

Use

Pointing method for filling foam insulator in gap between members of building e.g. wall body and frame of window and door using two-component foam insulator.

Advantage

Performs work easily in field by using two-component foam insulator without any special equipment that eliminates separate complementary curing work and suppresses quality deterioration of completed insulation foam due to surface coating by the tube. Improves applicability since each solution of two-component foam insulator is mixed easily in the tube. Enables securing good quality by using two-component foam insulator. Enables securing workability and economic property by using cheap tube that easily supplies material without any special equipment for pointing work. Eliminates need to prepare separate curing work since coating is formed on the surface of insulation foam by the tube. Suppresses quality deterioration of the insulation foam due to external factors since moisture absorption is intercepted by the surface tube.

Drawing Description

The drawing shows a perspective view of the sequence of pointing method using a two-component foam insulator.

10 - Two-component foam insulator.

20 - Tube.

A, B - Solution.

Table 5.8: EP2828057 (A2)

SIKA TECHNOLOGY AG (SIKA-C)	✓ Alive

Title DWPI:

Method for manufacturing insulation material filled hollow portion e.g. door frame profile, involves expanding discharged insulation material from plastic extrusion apparatus with high volume expansion gradient in hollow portion

Publication number (Kind Code):

EP2828057A2

Inventor(s):

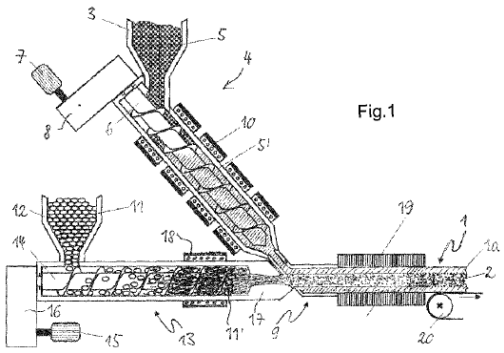
ACKERMANN H; BRUNNER A; HOEFFLIN F

Publication Date:

2015-01-28

Current IPC:

B29C 47/02; B29C 44/24; B29C 47/06; B29C 47/30; B29C 47/82; E06B 3/267



Abstract

Novelty

The method involves supplying an expandable insulation material (2) into a plastics extrusion apparatus (13) that is activated under pressure. The insulation material discharged into hollow portions or cavity (1) from the plastic extrusion apparatus is expanded with high volume expansion gradient such that the cross-section of hollow portion or cavity is completely filled with expanded insulation material. The hollow portion is an extruded profile of plastic material and the insulation material is introduced simultaneously with the formation of the plastic profile.

Detailed Description

An INDEPENDENT CLAIM is included for a plastic extrusion apparatus.

Use

Method for manufacturing insulation material filled hollow portion or cavity such as door or window frame profile (all claimed) made of plastic or metal, for sealing of joints or insulation of cavities in building structures or for joint sealing and insulation of profiles or other cavities in vehicle, aircraft and shipbuilding.

Advantage

The foamed or hollow cavities are formed under efficient utilization of large-scale technology and without intermediate handling and storage operations, and hence the manufacturing process is simplified and the cost reduction is achieved. The high and uniform process and quality control in the manufacturing process of insulated hollow portion are achieved, and hence the reliable product quality is provided to the consumer. The solid starting material of granular form can be easily and less expensively assembled, stored and processed.

Drawing Description

The drawing shows a sectional view of the plastic extrusion apparatus.

1 - Hollow portion.

2 - Insulation material.

3 - Funnel.

7, 15 - Motors.

13 - Plastic extrusion apparatus.

Table 5.9: CN105016620 (B)

UNIV WUHAN TECHNOLOGY (UYWU-N)	✓ Alive

Title DWPI:

Building insulation foam glass comprises base glass powder e.g. molybdenum tailings, quartz sand, limestone, talc powder, antimony oxide and sodium nitrate, float glass powder, borax, Glauber's salt, and carbon powder

Publication number (Kind Code):

CN105016620B

Inventor(s):

HE F; JIN M; MEI S; QI H; XIE J

Publication Date:

2017-07-11

Current IPC:

C03C 11/00

(19)中华人民共和国国家知识产权局

(12)发明专利

Abstract

Novelty

A building insulation foam glass contains 88-92 parts mass base glass powder, 5 parts mass float glass powder, 1-4 parts mass borax, 1-2 parts mass Glauber's salt, and 0.2-1 parts mass carbon powder. The base glass powder contains 35-55 parts mass molybdenum tailings, 20-35 parts mass quartz sand, 10-15 parts mass limestone, 1-4 parts mass talc powder, 10-15 parts mass calcined soda, 0.1-0.5 part mass antimony oxide and 0.1-0.5 part mass sodium nitrate.

Detailed Description

An INDEPENDENT CLAIM is included for preparation of building insulation foam glass, which involves adding base glass powder, float glass powder, borax and Glauber's salt to carbon powder, uniformly mixing, placing the mixture in a ball mill and then grinding for 2-4 hours to obtain a foam material, placing the foam material in a molding machine and then molding, placing the mixture in a furnace and then preheating at 550° C for 30 minutes, increasing the temperature and then heating under a heating rate of 5-10° C/minute, foaming the mixture at 850-910° C for 20-40 minutes and then cooling to 560-600° C, heating the mixture for 30 minutes and then annealing, and cooling to below 100° C under cooling rate of 2-3° C/minute.

Use

Building insulation foam glass (claimed).

Advantage

The building foam glass has excellent insulation properties, acid resistance, alkali resistance and corrosion resistance, absorbs radiation, and can be prepared with reduced energy consumption.

Technology Focus

CERAMICS AND GLASS- Preferred Components: The base glass powder is used in an amount of 0.5 wt.%, and has a fineness of 300 mesh. The float glass powder is used in an amount of 0.5 wt.%, and has a fineness of 300 mesh.

Drawing Description

n.a.

Table 5.10: RU2636015C2

SOUDAL	✓ Alive

Title DWPI:

Usage of polyurethane foam-forming composition for filling gap between window frame and outer perimeter of glass unit of window assembly, involves dispensing foam-forming composition of propellant from pressurized container

Publication number (Kind Code):

RU2636015C2

Inventor(s):

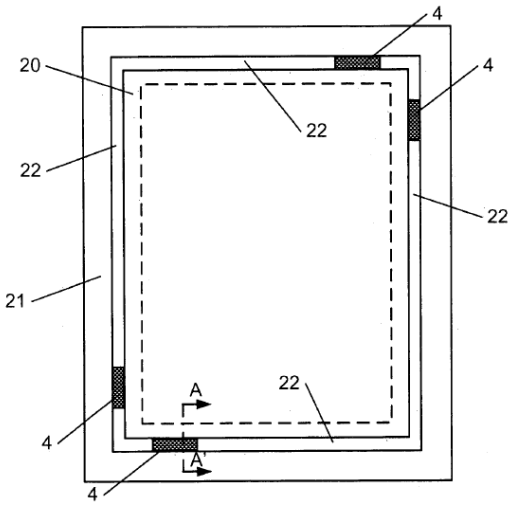
GEBOES P; VAN M F; VAN MIEGHEM F

Publication Date:

2017-11-17

Current IPC:

E06B 3/263



Abstract

Novelty

The usage of polyurethane foam-forming composition for filling gap (22) between window frame (21) and outer perimeter of glass unit (20) of window assembly is claimed. The foam-forming composition containing at least one propellant or blowing agent with total propellant concentration of 5 wt.% or more is dispensed from a pressurized container.

Detailed Description:

INDEPENDENT CLAIMS are included for the following: method for assembling window assembly; and method for replacing glass unit in window assembly.

Use

Usage of polyurethane foam-forming composition for filling gap between window frame and outer perimeter of glass unit of window assembly during assembling of window assembly and replacing glass unit in window assembly (all claimed) for building.

Advantage

The polyurethane foam-forming composition is environmentally-friendly. The window assembly formed using the polyurethane foam-forming composition has excellent thermal insulation characteristics, and requires smaller window frame for the same glass surface.

Technology Focus:

CERAMICS AND GLASS- Preferred Component: The glass unit comprises three glass panes filled with gas chosen from air, argon, krypton, xenon and sulfur hexafluoride. The glass pane has a metal layer containing silver or zinc. The window frame contains aluminum, polyvinyl chloride, steel or wood.
INORGANIC CHEMISTRY- Preferred Composition: The foam-forming composition comprises 10 wt.% or more, preferably 40 wt.% or less at least one propellant or blowing agent, 0.5 wt.% or more, preferably 30 wt.% or less at least one plasticizer and/or flame retardant and 0.2 wt.% or more, preferably 5 wt.% or less at least one foam stabilizer and/or surfactant, and expandable graphite.
ORGANIC CHEMISTRY- Preferred Composition: The propellant or blowing agent comprises fluorinated hydrocarbon.
POLYMERS- Preferred Composition: The foam-forming composition is one component foam composition, or moisture curing foam forming composition. The polyurethane foam forming composition comprises isocyanate-terminated prepolymer, less than 1 wt.% free methyl diphenyl diisocyanate, and silane-terminated prepolymer. Preferred Process: The chemical curing of foam-forming composition is at least partly achieved by reaction of reactive groups of reactive component (r1) comprising isocyanate- or silane functionality with reactive component (r2). The reactive component (r2) is added to foam-forming composition shortly or immediately, before composition is dispensed from the container.

Table 5.11: WO2017006138 (A1)

HERITAGE DEV LTD (HERI-N)	✓ Alive

Title DWPI:

Method for manufacturing construction panel that is used for construction of multi-storey buildings, involves allowing insulating foam precursor liquid to flow and expand to fill lateral extent of recess and to form foam layer

Publication number (Kind Code):

WO2017006138A1

Inventor(s):

ANTHONY W; BARTRAM M

Publication Date:

2017-01-12

Current IPC:

B29C 44/18; E04C 2/284; E04C 2/38

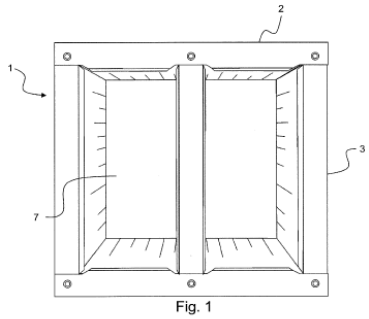
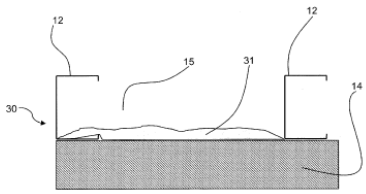


Fig. 1



Abstract

Novelty

The method involves laying a construction panel horizontally, such that a recess (15) faces upwardly with a backing (14) forming a base of the recess. Predetermined quantity of insulating foam precursor liquid i.e. water, is applied to the recess. The insulating foam precursor liquid is allowed to flow and expand to fill a lateral extent of the recess. The insulating foam precursor liquid is allowed to set to form a foam layer (16C). The insulating foam precursor liquid is allowed to set with a free main surface and configured to form polyurethane foam.

Detailed Description

INDEPENDENT CLAIMS are also included for the following:

a construction panel

a kit for constructing a building.

Use

Method for manufacturing a construction panel that is used for construction of multi-storey buildings.

Advantage

The method enables performing cold-forming process to provide a frame that is lightweight and economical and used in construction panels for buildings with high solidity, strength, durability and ease of construction. The method enables reducing site works and material waste and improving quality and thermal performance of the panel by filling the recess defined by the frame and the insulation sheet with insulating foam.

Technology Focus

POLYMERS- The insulating foam precursor liquid includes di or poly-isocyanate component and polyol component.

Drawing Description

The drawing shows a cross-sectional view of a construction panel.

12 - Frame.

14 - Backing.

15 - Recess.

16C - Foam layer.

20 - Service hole.

5.1.3 ER5: Innovative sealant for vacuum insulated glass

For this result two different levels of detail have been used. First a general research has been carried on, considering high level keyword (edge seal and ((vacuum adj insulat* adj (glass or glaz*)) or VIG)). This provided the scenario analysis in a more reliable way. Then, a more specific research has been made (((edge seal near (polymer or flexible or low temperature)) and ((vacuum adj insulat* adj (glass or glaz*)) or VIG))) providing a more detailed focus on the main relevant patents provided in the punctual analysis.
The analysis carried out provided 370 patents (corresponding to 51 INPADOC family). As it can be noticed from the following graphs in the last 10 years (2008-2018) there's been a positive temporal trend thus showing continuous interest towards the development of the technology behind the sealant for Vacuum Insulated Glass (VIG). In particular, there has been great interest towards patent applications from countries as US, Europe and Worldwide. Main player is Guardian Industries, who submitted more than 150 patents.

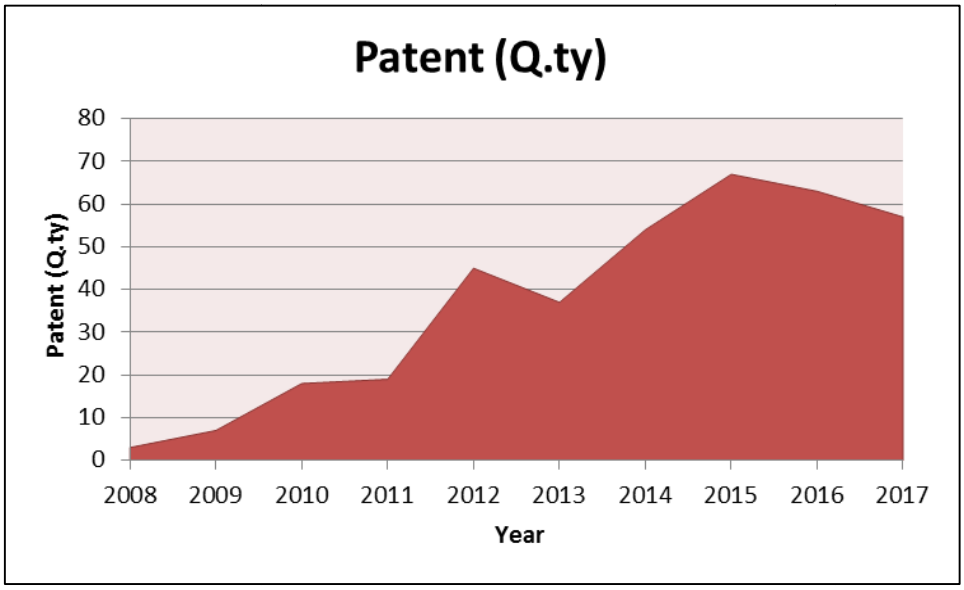


Figure 5.7: Patent temporal trend (2008-2018)

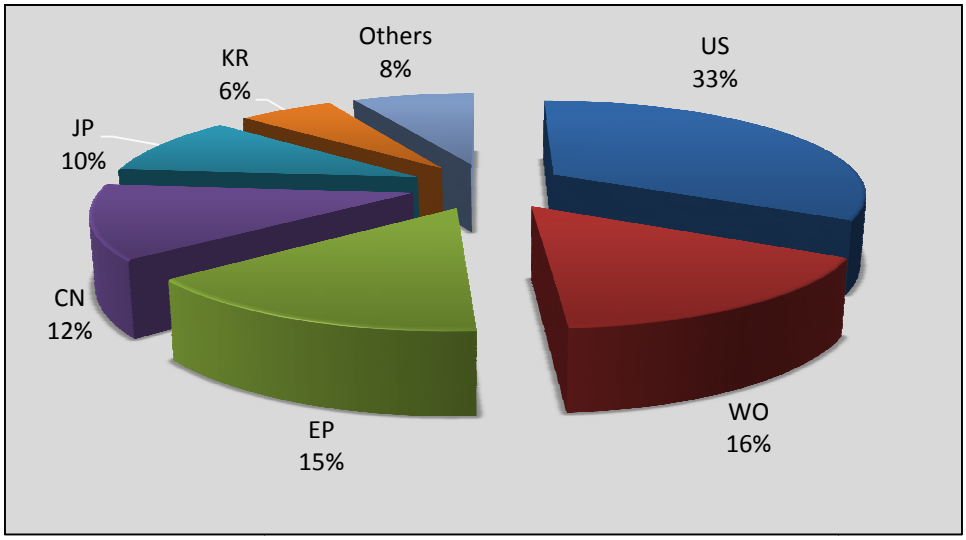


Figure 5.8: Patent Publication countries

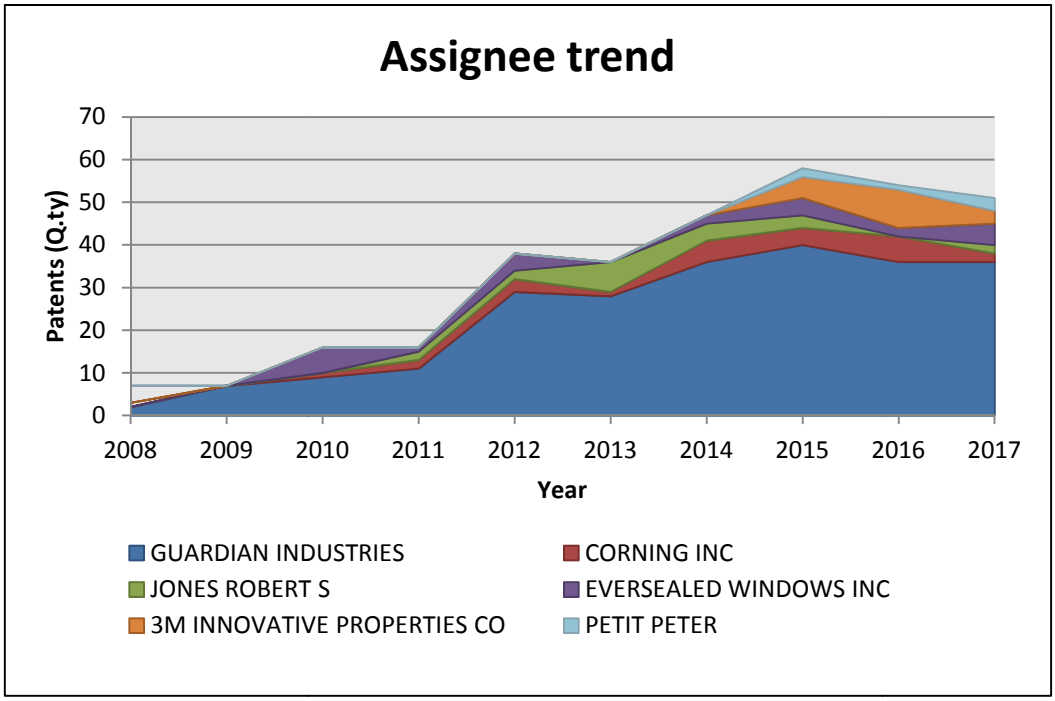


Figure 5.9: Trend of the main applicants

Tables below provide the most relevant patents analyzed, making particular focus on the following aspects:

- Edge seal for VIG
- Sealant for VIG
- Glass sealant for VIG

Table 5.12: US20110296797A1

MOTT L J (MOTT-I) ; STARK D H (STAR-I)	! Indetermined

Title DWPI:

Vacuum insulating glazing unit, has seal units that are bonded at ends to glass panes and has configuration which includes toward-pane oriented convolute and away-from-pane convolute

Publication number (Kind Code):

US20110296797A1

Inventor(s):

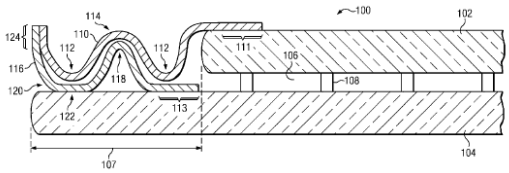
MOTT L J; STARK D H

Publication Date:

2011-12-08

Current IPC:

E06B 7/16; E04C 2/34



Abstract

Novelty

The unit (100) has a glass pane (104) which is spaced a apart from the pane (102) to define a cavity (106). The seal units (110, 116) are bonded at the ends to the glass panes. The seal units has configuration that includes a toward-pane oriented convolute (112, 120) and an away-from-pane convolute (114, 118). One of the convolute of the seal unit is nested within the like-oriented convolute of the other seal unit.

Use

Vacuum insulating glazing unit.

Advantage

The flexible edge seal retains the prescribed vacuum levels within the evacuated space by providing the pressure evacuation septum in the seal units. The flexible edge seal units withstand the mechanical force when the typical metal matched with the thermal co efficient of the soda lime glass.

Drawing Description

The drawing shows a sectional view of the vacuum insulating glazing unit.

100 - Vacuum insulating glazing unit.

102, 104 - Glass panes.

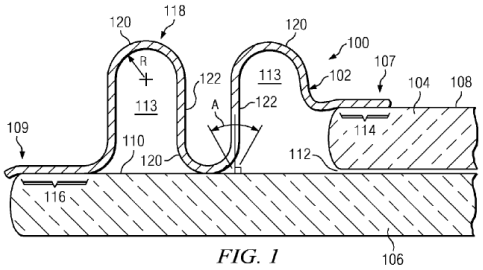
106 - Cavity.

110, 116 - Seal units.

112, 120 - Toward-pane oriented convolute.

114, 118 - Away-from-pane convolute.

Table 5.13: US2010688859A

EVERSEALED WINDOWS INC (EVER-N)	✓ Alive
Title DWPI: Flexible edge seal for vacuum insulating glazing unit has seal member having first and second ends hermetically bondable to first and second glass panes of vacuum insulating glazing unit, respectively, and center section having convolutes	 *FIG. 1*
Publication number (Kind Code): US2010688859A	
Inventor(s): Bettger Kenneth J., Pella, IA, US Stark David H., Evergreen, CO, US	
Publication Date: 2012-12-11	
Current IPC: E06B 3/66; E04C 2/54; F16J 15/02	

Abstract

Novelty

The flexible edge seal (100) has a seal member (102) formed of a hermetically bondable material and having a first end (107), a second end (109) and a center section disposed between first and second ends. The first end is hermetically bondable to a first glass pane (104) of vacuum insulating glazing unit, the second end is hermetically bondable to second glass pane (106) of vacuum insulating glazing unit separated from first glass pane by a space (112), and the center section comprises convolutes (118).

Use

Flexible edge seal for vacuum insulating glazing unit (claimed).

Advantage

Can accommodate strains associated with the expanding and contracting glass panes. Can withstand the mechanical forces imposed by atmospheric pressure on the seal. Can retain the prescribed vacuum levels within the evacuated space. Provides the required stress mitigation, atmospheric pressure resistance and vacuum containment functions, while allowing for high-volume manufacturing methods.

Drawing Description

The drawing shows the sectional view of the flexible edge seal having one piece seal member.

100 - Flexible edge seal.

102 - Seal member.

104 - First glass pane.

106 - Second glass pane.

107 - First end.

109 - Second end.

112 - Space.

118 - Convolutes.

Table 5.14: EP2324183B1

EVERSEALED WINDOWS INC (EVER-N)	✓ Alive

Title DWPI:

Flexible edge seal for providing airtight seal between spaced-apart panes of vacuum insulating glazing unit, has edge seal portions including center portion that is asymmetrical to another center portion with respect to plane

Publication number (Kind Code):

EP2324183B1

Inventor(s):

BETTGER K; BROWN E; MOTT L

Publication Date:

2014-06-25

Current IPC:

E06B 3/66

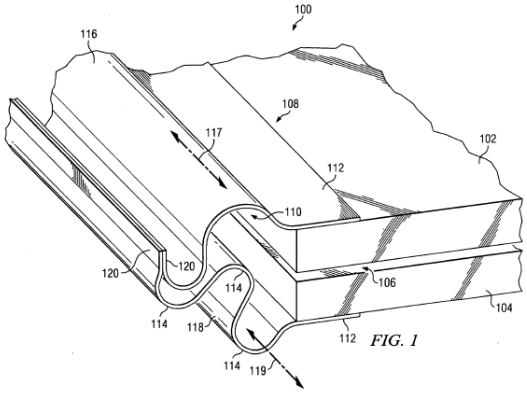


FIG. 1

Abstract

Novelty

The seal (108) has edge seal portions (116, 117) defining longitudinal axes (117, 118), respectively. The seal portions are provided with constant cross-sections when viewed along the axes. Each cross-section includes a bonding flange (112) with a flat portion for hermetic bonding to a surface of one of glass panes (102, 104). Weld surfaces (120) of the cross-sections are hermetically joined to one another to form a hermetic seal. One of center portions of the seal portions is provided with a convolute cross-section and is asymmetrical to the other center portion with respect to a plane.

Use

Flexible edge seal for providing an airtight seal between spaced-apart panes of a vacuum insulating glazing unit (claimed).

Advantage

The seal forms a hermetic seal to maintain vacuum between the glass panes, when hermetically bonded at the bonding flanges to the respective adjacent panes, thus relieving transient stresses to eliminate the issue of the vacuum insulating glazing unit (VIGU) bowing under differential outer and inner temperatures. The asymmetric arrangement of the seal minimizes the volume the seal occupies at the edge of the VIGU. The seal provides convolutes on one side to be nested within convolutes on the other side, thus minimizing the protrusion of the bellows profile beyond the viewing planes of the glass panes. The seal minimizes the risk of handling damage to the joint and to the seal.

Drawing Description

The drawing shows a partial cross-sectional perspective view of a vacuum insulating glazing unit including a flexible edge seal.

102, 104 - Glass panes.

108 - Flexible edge seal.

112 - Bonding flange.

116, 118 - Edge seal portion.

117, 119 - Longitudinal axes.

120 - Weld surfaces.

Table 5.15: EP2099997B1

GUARDIAN INDUSTRIES	✓ Alive

Title DWPI:

Thermally insulating glass panel for use in vacuum insulating glass unit, has edge seal with U-shaped metal member bonded to two glass substrates, and two parallel legs connected to each other with base

Publication number (Kind Code):

EP2099997B1

Inventor(s):

COOPER D; COOPER D J

Publication Date:

2011-04-20

Current IPC:

E06B 3/663

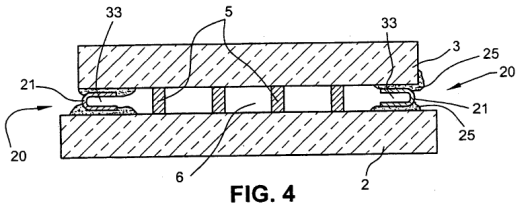


FIG. 4

Abstract

Novelty

The panel has two spaced apart glass substrates (2, 3) defining a low pressure space including a pressure less than atmospheric pressure. A set of spacers (5) is arranged between the glass substrates for spacing the substrates from one another. A hermetic edge seal (20) is arranged partially between the glass substrates for hermetically sealing a low pressure space. The edge seal comprises a U-shaped metal member bonded to each of the two glass substrates. Two parallel legs are connected to each other with a base.

Use

Thermally insulating glass panel for use in a vacuum insulating glass unit.

Advantage

The flexibility of the edge seal reduces the amount of optical distortion caused by flexing of the window, and the likelihood of window breakage.

Drawing Description

The drawing shows a cross sectional view of a vacuum insulating glass (IG) unit.

2, 3 - Substrates.

5 - Spacers.

20 - Edge seal.

25 - Bonding material.

33 - Interior cavity.

5.1.4 ER6: Innovative getter for vacuum insulated glass

In order to get a preliminary rough result of the patent analysis of this result, the research has been performed starting from 2008 up to day.

The query used to obtain a patent dataset referring to processes able to apply foam into insulated curtain wall units is *"((getter) and ((vacuum adj insulat* adj (glass or glaz*)) or VIG))"*.

The query results in a total of 58 patents selected (corresponding to 15 INPADOC families). As it can be noticed from the following graphs in the last 10 years (2008-2018) there's been a positive temporal trend showing a peak of interest in 2015 and again a growing trend in 2017. In particular, there has been great interest towards patent applications mainly from US, followed by China. Main players are Guardian Industries who submitted 26 patents respectively, detaching the other applicants (like Eversealed windows Inc) who submitted 6 patents or less.

In the following the main results of the scenario analysis it's been reported.

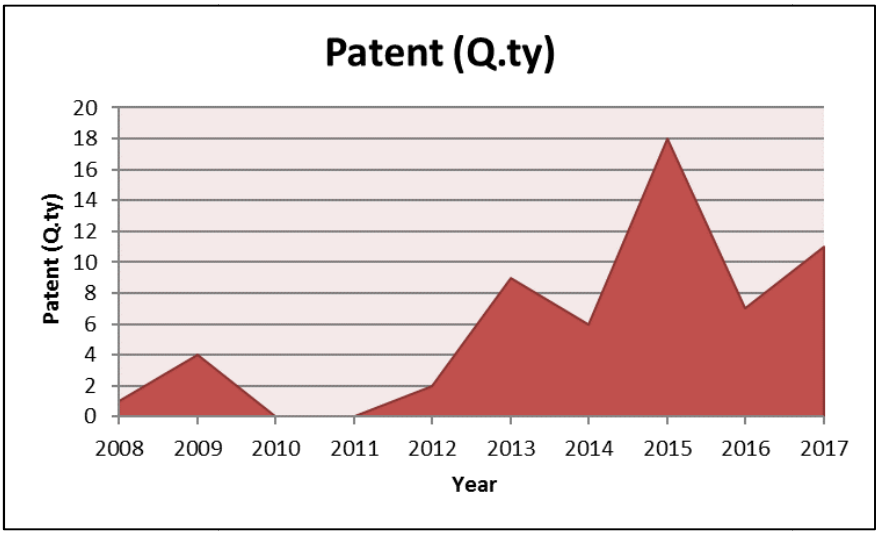


Figure 5.10: Patent temporal trend (2008-2018)

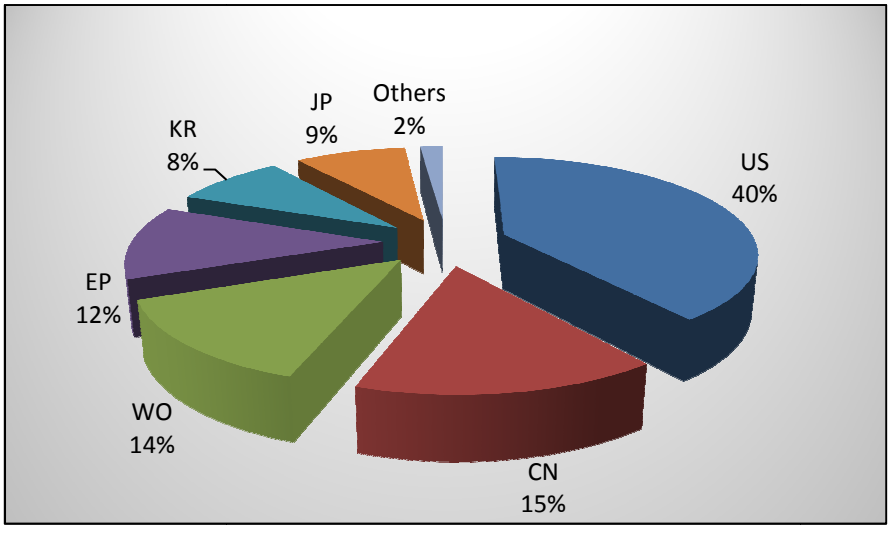


Figure 5.11: Patent Publication Countries

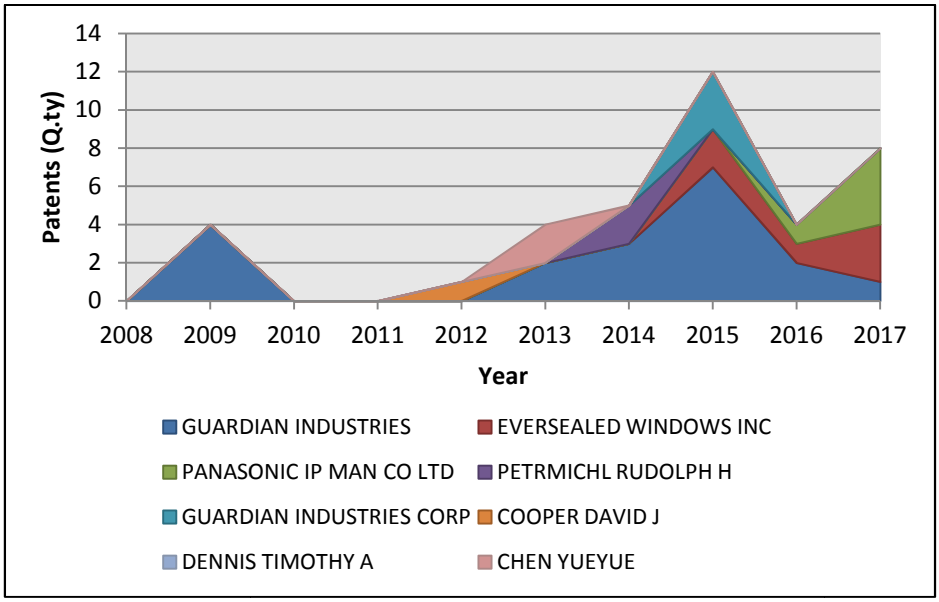


Figure 5.12: Trend of the main applicants

Tables below provide the most relevant patents analyzed.

Table 5.16: US20170361598A1

GUARDIAN GLASS LLC	✓ Alive

Title DWPI:

Method for making vacuum insulated glass window unit in e.g. office building, involves directing laser beam through pump-out tube supported by glass substrate, so that laser beam impinges upon getter and activates getter

Publication number (Kind Code):

US20170361598A1

Inventor(s):

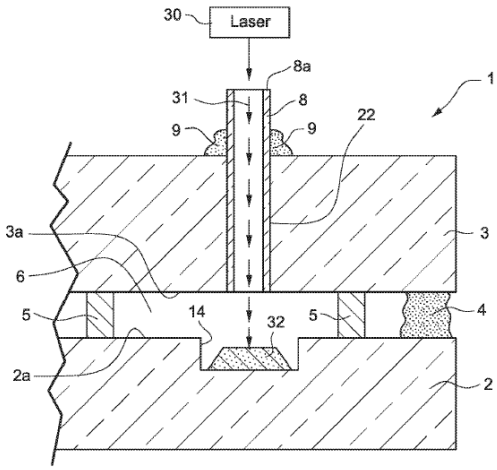
HOGAN J; HOGAN J P; PANTKE A; PANTKE A W; PETRMICHL R; PETRMICHL R H

Publication Date:

2017-12-21

Current IPC:

B32B 37/14; B32B 37/10; E06B 3/66; E06B 3/677



Abstract

Novelty

The method involves providing two parallel glass substrates (2, 3), a set of spacers (5), a peripheral edge seal (4) between the substrates, a cavity (6) to be evacuated to pressure less than atmospheric pressure between the substrates, and a getter (32) supported by one of the substrates. A laser beam (31) is directed through a pump-out tube (8) that is supported by the other substrate, so that the laser beam impinges upon the getter and activates the getter at end of evacuation process in which the cavity is evacuated to the pressure less than atmospheric pressure.

Use

Method for making a vacuum insulated glass (VIG) window unit. Uses include but are not limited to residential home, office building, apartment building and door.

Advantage

The method allows the VIG unit to be heated to about 150-300 degree Celsius, so that energy and time required to activate the getter can be reduced by performing the activation during evacuation process, thus minimizing the time required for activation to overlap time required for evacuation from about 3 to 12 minutes, and hence reducing the time required to make the VIG window unit.

Drawing Description

The drawing shows a cross-sectional view of a VIG window unit.

2, 3 - Parallel glass substrates.

4 - Peripheral edge seal.

5 - Spacers.

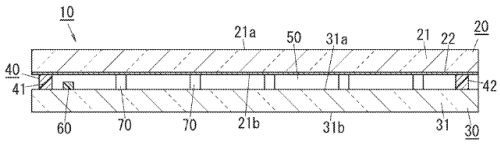
6 - Cavity.

8 - Pump-out tube.

31 - Laser beam.

32 - Getter.

Table 5.17: US20170361598A1

PANASONIC IP MAN CO LTD	✓ Alive
Title DWPI: Vacuum-insulation glass panel unit has gas-adsorption layer with getter is arranged inside of vacuum space, and is visually recognized through one of glass panels, so as to change color by adsorbing gas.	
Publication number (Kind Code): US20170361598A1	
Inventor(s): ABE H; HASEGAWA K; ISHIBASHI T; URIU E	
Publication Date: 2017-10-12	
Current IPC: G01M 3/02; C03C 27/06; G01N 7/04; G01N 21/78	

Abstract

Novelty

The Vacuum-insulation glass panel unit (10) has a seal (40) that is positioned between a first glass panel (20) and second glass panel (30) to join glass panels airtightly to frame shape. Vacuum space (50) is enclosed with glass panels and the seal. A gas-adsorption layer (60) with getter is arranged inside of vacuum space, and is visually recognized through one of glass panels, so as to change color by adsorbing gas. The getter is provided with zeolite which carried out copper ion exchange.

Use

Vacuum-insulation glass panel unit.

Advantage

Since the inspection method of the glass panel unit can judge the vacuum degree of vacuum space easily by color change, the vacuum is maintained easily.

Drawing Description

The drawing shows a sectional view of the vacuum-insulation glass panel unit.

10 - Glass panel unit.

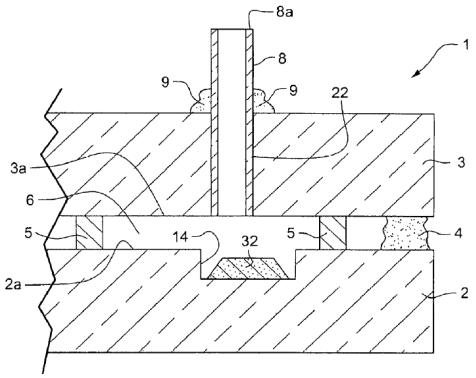
20, 30 - Glass panels.

40 - Seal.

50 - Vacuum space.

60 - Gas-adsorption layer.

Table 5.18: US20160319587A1

PANASONIC IP MAN CO LTD	✓ Alive
Title DWPI: Vacuum insulated glass (VIG) window unit has getter structure that is provided with recess comprising base and sidewall defined in second substrate, rough surface area, and rough and porous coating	
Publication number (Kind Code): US20160319587A1	
Inventor(s): HOGAN J; HOGAN J P; PETRMICHL R; PETRMICHL R H	
Publication Date: 2016-11-03	
Current IPC: E06B 3/66; E06B 3/663; E06B 3/677; E06B 9/24	

Abstract

Novelty

The unit has a getter structure that is provided on a second substrate (3) and located opposite to a getter recess (14) in a first substrate. The structure is designed to increase getter material surface area provided on second substrate after getter activation. The structure is provided with a recess comprising a base and a sidewall defined in second substrate, a rough surface area where second substrate is roughened and where rough surface area is rougher than a major interior surface (3a) of second substrate facing a space (6), and a rough and/or porous coating.

Use

Vacuum insulated glass (VIG) window unit.

Advantage

Since the structure is provided with a recess comprising a base and a sidewall defined in second substrate, porous coating, and a rough surface area where second substrate is roughened so that the rough surface area is rougher than a major interior surface of second substrate facing a space. Thus, the roughening of the base of the recess allows the getter material to realize more active gettering surface so as to allow more undesirable gases to be absorbed.

Drawing Description

The drawing shows a cross sectional view of the VIG window unit.

2, 3 - First and second substrates.

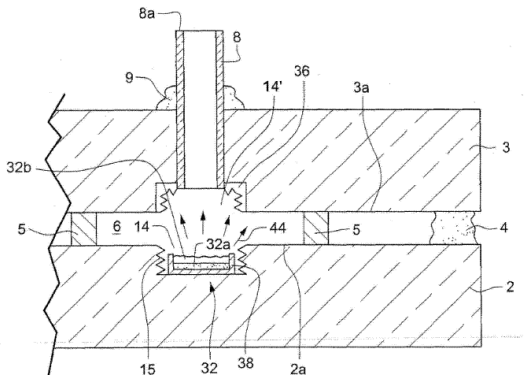
3a - Major interior surface of second substrate.

6 - Space.

14 - Getter recess.

32 - Getter material.

Table 5.19: CN104685148A

GUARDIAN INDUSTRIES	✓ Alive
Title DWPI: Method for making vacuum insulated glass window unit that is utilized in e.g. residential homes, involves supporting hybrid getter by glass substrate, and activating hybrid getter, where getter is made of non-evaporative getter material	
Publication number (Kind Code): CN104685148A	
Inventor(s): HOGAN J; HOGAN J P; PETRMICHL R; PETRMICHL R H	
Publication Date: 2015-06-03	
Current IPC: E06B 3/66; E06B 3/677	

Abstract

Novelty

The method involves providing multiple spacer/spillars (5) and a seal (4) between a first glass substrate (2) and a second glass substrate (3). A cavity/evacuated low-pressure space (6) is evacuated to pressure less than atmospheric pressure located between the first and second glass substrates. A hybrid getter (32) is supported by the first glass substrate and made of non-evaporative getter (NEG) material (32a) and evaporative getter (EG) material (32b). The NEG material is partially covered by the EG material. The hybrid getter is activated.

Use

Method for making a VIG window unit (claimed) that is utilized in residential homes, office buildings and apartment buildings.

Advantage

The method enables activating the hybrid getter with minimum time during evacuation process, thus reducing time needed to make a VIG window unit during evacuation process. The method enables compacting a EG layer to prevent or reduce exposure of the NEG material to an atmosphere during firing/heating of a frit for forming the edge seal and improving gas barrier properties and protecting the NEG material by EG layer with additives. The method enables forming coating material such as low-E coating with interior surfaces of the glass substrates, thus increasing performance characteristics of a VIG window unit.

Drawing Description

The drawing shows a partial sectional view of a VIG window unit prior to flashing/activating the EG material of the hybrid getter.

2, 3 - Glass substrates.

4 - Seal.

5 - Spacer/spillars.

6 - Cavity/evacuated low-pressure space.

32 - Hybrid getter.

32a - NEG material.

32b - EG material.

6 Main conclusions and next actions

The present document aimed at providing an overview of the main provisions related to intellectual property rights, use and dissemination of the results (also named foreground) generated by the EENSULATE project. The main purpose is to ensure that relevant results are formulated and compiled into a protectable form and that all activities required to protect the knowledge generated are duly taken into account before communication, dissemination and exploitation are undertaken.

To this aim, within the document partners are made aware of the procedures to be followed when generating new knowledge, as well as disseminating and exploiting it.

At this stage of the project, discussions among the IPR manager (RINA) and the partners responsible for the identified Exploitable Results have been hold towards the definition of the best IP protection form for each of them. Thus, for some of them patenting option was selected and a preliminary patent analysis has been performed as a first step to understand the panorama before filing for a patent effectively.

As the document is a "living" document, more the different results become clearer and information enough, further actions for the protection of each result will be carried on. In particular an update of the preliminary patent analysis performed will be done upon request. A preliminary patent analysis will be performed for those results that at this stage of the project were not completely mature for the analysis. Furthermore a preliminary analysis on standardization activities will be carried on.

Any update will be included in the next release of the document, due to Month 42 (January 2020).

ANNEX 1- Evaluation Template for potential patentable idea

EENSULATE - Innovation Action
G.A. 723868
H2020- EEB-2016
EEB-01-2016
Highly efficient insulation materials with improved properties

Innovation Idea

Subject:

Description:

Type of protection :

- □ Patent
- □ Trademark
- □ Industrial Design
- □ Copyright
- □ Other

Protection Rational:

Potential Market:
Scientific Responsible:
Keywords:
Work-package(s):
Partners involved:

ANNEX 2- Evaluation Template for selected ERs preliminary patent analysis

EENSULATE - Innovation Action

G.A. 723868

H2020- EEB-2016

EEB-01-2016

Highly efficient insulation materials with improved properties

Subject: Highly insulating environmentally friendly bi-components foam

Innovation Idea

The chemical nature of the foam will lead to improved results in technical performances increasing the fire safety.

Description:

This is a polyurethane two component foam based on nanosized inorganic fillers with suitable molecules that will ensure:

	TCF
Density (Kg/m3)	30-50
Fire rating startin point (Class)	B-s1-d0
lambda (W/mK)	0,020-0,035
Dispensing time in focchi (sec)	1-10

The two component foams is based on the synergic effect of the polyurethane foam, the nanosized inorganic fillers to enhance the fire resistance properties.
EEnsulate foam will bea system composed by a 2K PU system to fill the spandrel and 1K foam to be used in finishing works and seal windows.

Type of protection :

X Patent

□ Trademark

□ Industrial Design

□ Copyright

□ Other

Protection Rational:

Need of protection towards allowing SELENA to undertake heavy investment programme to accelerate the industrialization of the novel foam.

Potential Market:

The new technology will lead to a novel high performing foam with increased insulation. This foam will be delivered to the final customer in liquid form and transformed directly in the production facility. The final user will use less material and will transport less volume.

After the end of the EENSULATE project, SELENA will undertake a heavy investment programme to accelerate the industrialisation of the novel foam in line with the speed of SAES so that the product can reach the market same time for integration in new curtain walls by FOCCHI and windows by BGTEC.

Scientific Responsible:

SELENA

Keywords:

- Nanocomposite insulating foam
- Polymeric nanocomposites
- Inorganic fillers
- Layered materials
- Polymer foam matrix
- Polyisocyanurate
- Lamellar powder
- PIR
- Polyurethane
- Fire
- EN13501
- Thermal insulation

Work-package(s):

WP2 – Task 2.1, 2.3, 2.4

Partners involved:

- SELENA for the development of inorganic fillers and for the characterization of the final product through different test, mainly internally fire test in cooperation with ULSTER University
- EVONIK for the development of tailored surfactants
- FOCCHI and RINA to check compliancy with manufacturing and design strategy respectively
- BGTEC to check compliancy with requirements and historical building retrofitting.

EENSULATE - Innovation Action

G.A. 723868

H2020- EEB-2016

EEB-01-2016

Highly efficient insulation materials with improved properties

Subject: Development of a specific process and equipment in order to fill curtain walling modules with insulation foam along an industrial assembling line.

Innovation Idea

Development of a process able to apply the EENSULATE foam into insulated units: to develop *process and equipment to apply foam in curtain wall spandrel units*

Description:

The EENSULATE insulated module will benefit of the novel and high performing insulation foam. The foam will be poured into spandrel units along an industrialized assembling line. A specific application method capable to suit several unit dimensions, the equipment and the containment shall be developed. The use of spray foam to reduce thermal bridges will be easily applied with respect to using rock wool or other insulating mats which require long and very costly manual operations.

Type of protection :

X Patent

□ Trademark

□ Industrial Design

□ Copyright

□ Other

Protection Rational:

The Patent seems to be the best option for protecting this result.

Potential Market:

FOCCHI expects to exploit the new manufacturing line process using the injected foam to manufacture the spandrel panels.

Investments will be covered internally as well as accessing a regional private equity fund.

This will be overall a key driver for them to get new market shares versus large competitor like Permastelisa.

Scientific Responsible:

FOCCHI

Keywords:

- Foam application process
- Foam poured in spandrel units

• Testing foam quality in spandrel
Work-package(s): WP 4 – Task 4.2
Partners involved: 1. FOCCHI and for the manufacture of the first full-scale prototypes 2. SELENA for the foam and the calculation of the volume of the foam needed for the solution 3. UNIVPM for the development of NDT to detect the quality of the manufactured spandrel with foams.

EENSULATE - Innovation Action

G.A. 723868

H2020- EEB-2016

EEB-01-2016

Highly efficient insulation materials with improved properties

Subject: Innovative sealant for Vacuum Insulated Glass

Innovation Idea

Despite its polymer nature, it will provide high permeation barrier performances and, together with the pumping action of a proper getter solution, will maintain the pressure inside the evacuated chamber below 0.1 Pa, thus providing the optimum VIG thermal insulation characteristics.

Description:

This innovative and durable low temperature sealing material is a polymer-based low processing temperature (below 200 °C) sealing material that will ensure:

- A processing temperature below to 200°C, allowing the use of an high performance low-emissive (1% emissivity compared to 10% used in the current VIG products and development in the pipeline) coating the glazing and solar control coatings
- Superior permeation barrier performances able, together with the getter solution, to maintain the total pressure inside the evacuated chamber below 0.1 Pascal threshold, thus providing the best thermal insulation characteristics
- Mechanical flexibility characteristics similar to that actually provided by the sealents typically used in a gas filled glazing chambers.

Type of protection :

X Patent

□ Trademark

□ Industrial Design

□ Copyright

□ Other

Protection Rational:

Need of protection towards allowing SAES to become a “solutions provider” in a brand new market (related to vacuum glass low T manufacturing technology)

Potential Market:

The vacuum glass low T manufacturing technology realized according to EENSULATE specifications will exceed the present building construction and retrofitting limits, allowing SAES to become a “solutions provider” in a brand new market and integrating the company in a new supply chain with high added value.

After the project is over, preparation protocols with indication of production equipment, already tested

at lab scale, will be transferred to the industrialization team for the set-up of two new production lines, respectively dedicated to the flexible sealant (up to 70 ton per year)and the getter material manufacturing (50 ton of getter paste per year). The developed products will be also promoted as innovative solutions for the hermetic sealing of different products, such as evacuated solar thermal collectors.
Scientific Responsible: SAES
Keywords: The keywords we would like to suggest are: • glass/polymer edge seal VIG • low temperature sealing • dispensable polymer edge seal • flexible edge seal • polymer gas/Ar barrier
Work-package(s): WP3-Task 3.2
Partners involved: • SAES for the development of the sealant • ULSTER for the compatibility of the novel edge seals with tempered glass and a range of low-e and dynamics coatings • Other partners are involved in the definition of the VIG (and consequently of the sealant) specification (mainly RINA, TVITEC, ULSTER and FOCCHI)

EENSULATE - Innovation Action

G.A. 723868

H2020- EEB-2016

EEB-01-2016

Highly efficient insulation materials with improved properties

Subject: Innovative getter for Vacuum Insulated Glass

Innovation Idea

Current getters for VIG are traditional discrete NEG (Non Evaporable Getters) pills and are thick, visible, typically located in a corner, requiring high temperature activation (400 °C) and with limited sorption capacity. The innovative solution, being distributed, will minimize pressure gradients along the VIG and will be invisible, also not requiring glass panel machining to host a thick NEG. Furthermore, it will have higher sorption capacity.

Description:

It is a peripheral distributed getter solution able to maintain the total pressure inside the VIG below 0.1 Pascal for at least 20 years. The innovative getter will have the following characteristics:

- Low activation temperature (below 200 °C)
- Significant sorption capacity for all the gas species present in the atmosphere (nitrogen, oxygen, CO2, VOC etc.) with the only exception of the noble gases, which at the end will remain the main contributors to the final VIG pressure.
- Distributed positioning inside the vacuum chamber, to reduce pressure gradients related to the presence of some getters in a single location and improving the sorption speed which could be affected by the low conductance inside the VIG.

Type of protection :

X Patent

□ Trademark

□ Industrial Design

□ Copyright

□ Other

Protection Rational:

Need of protection towards allowing SAES to become a “solutions provider” in a brand new market (related to vacuum glass low T manufacturing technology)

Potential Market:

The vacuum glass low T manufacturing technology realized according to EENSULATE specifications will exceed the present building construction and retrofitting limits, allowing SAES to become a “solutions provider” in a brand new market and integrating the company in a new supply chain with high added value.

After the project is over, preparation protocols with indication of production equipment, already tested

at lab scale, will be transferred to the industrialization team for the set-up of two new production lines, respectively dedicated to the flexible sealant (up to 70 ton per year) and the getter material manufacturing (50 ton of getter paste per year). The developed products will be also promoted as innovative solutions for the hermetic sealing of different products, such as evacuated solar thermal collectors.
Scientific Responsible: SAES
Keywords: The keywords we would like to suggest are: • distributed getter technologies for VIG • distributed getter for VIG • gas absorbers for VIG • low temperature activation getter technology for VIG • thin film distributed getter for VIG
Work-package(s): WP3-Task 3.3
Partners involved: SAES only

EENSULATE - Innovation Action

G.A. 723868

H2020- EEB-2016

EEB-01-2016

Highly efficient insulation materials with improved properties

Subject: "**EENSULATE mono-component foam for windows application**"

Innovation Idea: A new type of monocomponent foam will be developed, with increased yield and fire properites

Description:

A novel one component foam combining the activity of nanosized inorganic filler and innovative additive will be developed with the following properties:

	OCF
Density (Kg/m3)	15-25
Fire rating starting point (Class)	B2
lambda (W/mK)	0,034-0,045
Dispensing time in focchi (sec)	150-200

The one component foam will be developed with specific properties to disperse efficiently the powder in a stable emulsion for 12 months.

EEnsulate foam will be a system composed by a 2K PU system to fill the spandrel and 1K foam to be used in finishing works and seal windows.

Type of protection :

X Patent

□ Trademark

□ Industrial Design

□ Copyright

□ Other

Protection Rational:

Need of protection towards allowing SELENA to undertake heavy investment programme to accelerate the industrialization of the novel foam.

Potential Market:

The new technology will lead to a novel high performing foam with increased insulation. This foam will also be available in different container compared to state of art (to be used in the building site for thermal breaks or during manufacturing of spandrel components), easier to use and refillable. The final user will use less material and will transport less volume.

After the end of the EENSULATE project, SELENA will undertake a heavy investment programme to accelerate the industrialisation of the novel foam in line with the speed of SAES so that the product can reach the market same time for integration in new curtain walls by FOCCHI and windows by BGTEC.
Scientific Responsible: SELENA
Keywords: • Nanocomposite insulating foam • Polymeric nanocomposites • Inorganic fillers • Layered materials • Polymer foam matrix • One component foam • Lamellar powder • Stable dispersion • Isocyanurate additive • Thermal insulation • isocyanurate prepolymer
Work-package(s): WP2 – Task 2.1, 2.3, 2.4
Partners involved: • SELENA for the development of inorganic fillers and for the characterization of the final product through different test, mainly internally fire test in cooperation with ULSTER University • EVONIK for the development of tailored surfactants • FOCCHI and RINA to check compliancy with manufacturing and design strategy respectively • BGTEC to check compliancy with requirements and historical building retrofitting.