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Super Insulating Materials : SIM
IEA EBC Annex 65 & EU relevant projects

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Introduction

Why SIM ?


What are SIM ?

Technical Assessment – Certification – Normalization

European Projects


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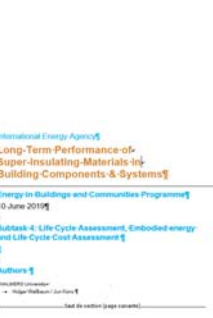
IEA-EBC – Annex 65

Long Term Performance of Super Insulating Materials in Building Components and Systems










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Heat, the largest energy end-use

50% of total energy consumption : to provide heating for homes, industrial purposes and other applications.

- 50 % : industry, process heat, drying and industrial hot water uses.
- 46% : space and water heating (60 to 80%) and cooking in the buildings sector.
- The remainder was used in agriculture.

In 2017, only 10% of heat was produced from renewables.

Source : <https://www.iea.org/renewables2018/heat/#summary>

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2050 : Challenges in the building sector

New Buildings

- NZEB : a well insulated building first
- only 10 % to 20 % of additional energy consumption (2050)

Renovation/Retrofitting

- Building stock : more than 80% of energy consumption.
- About 75% of current buildings will still be standing in 2050

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Why new insulating materials ?

1 : still, too much thermal bridges, even for ETICS

2 : Space savings

3 - Fire risks for ETICS

4 – Low room temperature & diseases

Source: POUGET consultant

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What are Super Insulating Materials ?

Advanced Porous Materials APM	Vacuum Insulation Panel VIP

Thermal conductivity of embedded gas

$$\lambda_g = \frac{\lambda_{g0}}{1 + C \cdot \frac{T}{\delta \cdot P}}$$

25 mW/mK for still AIR

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SIM : from mature products

Packaging Seams & fringes

Protection Insulating layer

Belgian production facility (Promat)

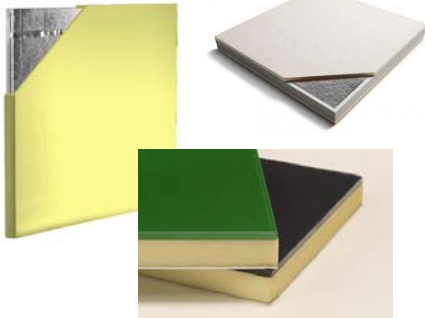
Source : Annex39 – HIPTI - 2004 Source : BPIE – PROMAT - MORGAN Plc

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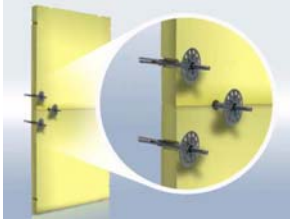
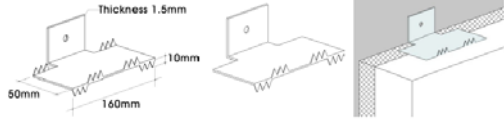
CSTB / To system solutions with important innovation potential
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VIP with protection layers for Handling & Transportation, Installation & Service Life (T&RH)



Sources : va-Q-tec – Recticel - IQ panel,

Fixing & Fastening

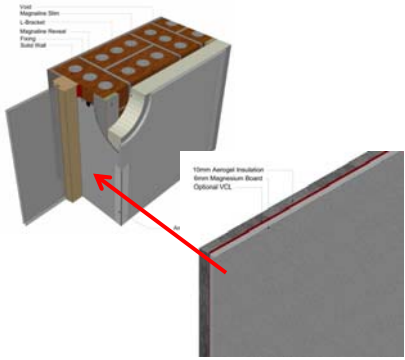
Evaluation of Mechanically and Adhesively Fixed External Insulation Systems Using Vacuum Insulation Panels for High-Rise Apartment Buildings - Sihyun Park, Bo-Hye Choi, Jae-Han Lim and Seung-Yeong Song
Energies 2014, 7, 5764-5786; doi:10.3390/en7095764

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Aerogel Blanket for Thermal Bridges Treatment of Window Reveals



Source : Enviroform

Aerogel Insulating Plaster

- $\lambda = 0.028 \text{ W/mK}$
- Commercially sold since 2013
- Water repellent & diffusion open
- Swiss environmental award at Swissbau 2014
- Innovation award „Praxis Altbau“ at BAU 2015



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CSTB / **EOTA – EAD for VIP & AEROGEL**
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CSTB / **Certification & Technical Assessment**
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Avis Technique 20/15-360

Optima VIP application en mur

Commission chargée de formuler des Avis Technique et des Documents Techniques d'Application (DTA) du 21 mars 2012
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CSTB / CEN/ISO
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CEN/TC 88/WG 11 N 148

Thermal insulation products for buildings — Factory made Vacuum Insulation Panels (VIP) — Specification

Produits isolants thermiques pour le bâtiment — Produits manufacturés en laine vacuum isolation panel (VIP) — Spécification

Source : Ulrich PASSON – Saint Gobain
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CSTB / European Projects : <http://amanac.eu/>
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AEROCOINS : Aerogel-based composite/hybrid nanomaterials for cost-effective building superinsulation systems

HIPIN : High Performance Insulation based on Nanostructure Encapsulation of Air

NANOINSULATE : Robust, cost-effective opaque and transparent vacuum insulation panels (VIPs) incorporating new nanotechnology-based core materials.

VIP4ALL : Highly Sustainable and Effective Production of Innovative Low Cost Vacuum Insulation Panels for Zero Carbon Building Construction

HOMESKIN : The HOMESKIN project aims at developing a new silica Advanced Aerogel-Based Composite

GELCLAD : Highly efficient cladding eco-panels with improved nano-insulation properties

INNOVIP : Innovative multi-functional Vacuum-Insulation-Panels (VIPs) for use in the building sector

WALL IN ONE : WALL Insulation NOvel Nanomaterials Efficient systems

EENSULATE : 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.

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Two Associations to promote VIP & APM

VACUUM INSULATION PANEL

 **V I P A**

GLOBAL ASSOCIATION

<https://vipa-international.org/>

 **AdvaPor**
Advanced Porous Materials Association

Advanced Porous Materials

<http://advapor.org/>

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IVIS

IVIS Paris 2017
13th International
Vacuum Insulation Symposium
September 20-21, 2017

<http://ivisparis2017.org/>

IVIS KYOTO 2019
- 14th -
International Vacuum Insulation Symposium
September 19 - 20, 2019, Kyoto, Japan

<http://ivis2019.jp/>

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- **SIM are mature materials**, even if there is further room for improvement to expand their application areas.
- The development and uses of SIM are spreading around the world. **Market growth remains slow** but is expected to rise within the next decade, especially in Asia.
- Recommendations on how to perform reliable testing of components and buildings integrating SIM are now available and are shared among the actors, while a first standard is expected to be published imminently.

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- The SIM sector must now evolve **from a single material or product to a system solution**, rather as the windows sector did by shifting from separate frames and glazing elements to integrated windows. In other words, a Vacuum Insulation Panel can be considered as an “opaque glazing” element with similar handling & installation constraints to a window system. Therefore, insulation installers should acquire new skills.

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- **Good design is important**, and coupling with traditional insulation materials is recommended in order to improve SIM service life.
- Application guidelines would be very useful for installers.
- In the future, Life Cycle Assessment of SIM needs to be improved; the methodology is ready but reliable data are expected from industry.

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QUESTIONS ?

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