

IEA-EBC Annex 65

Long-Term Performance of Super-Insulating Materials (SIM) in Building Components & Systems

IEA Energy in Building & Communities

Achieving near zero energy use through open innovation

18 February 2014

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CSTB

- Energy Saving in the Building Sector
 - Space Heating + Domestic Hot Water + Refrigeration
 - = more than 80 % of energy consumption

- Most of the Energy is wasted and not used on purpose – Heat Leaks is the first energy user !

- Thermal Insulation is among the most cost-effective carbon abatement measures

- Thermal Performance of the Building Envelope is a top priority

■ New Buildings

- NZEB (Net Zero Energy Building)
- 10 % to 20 % of additional energy consumption (2050)

■ Renovation/Retrofitting

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

- Super-Insulating Materials
 - Vacuum Insulation Panel
 - Nano-Porous Materials such as Aerogel

- Performance & Durability

- Implementation Techniques

- Sustainability
 - LCA, LCC, Embodied Energy (Annex 57)

Super Insulating Materials

**Nano-Porous Materials
 Aerogel**



**Gas Filled Panel
 GFP**



**Vacuum Insulation Panel
 VIP**



$$U = \lambda / e \text{ W/m}^2\text{K}$$

λ : thermal conductivity
 e : thickness

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

Pore size Pressure



- AEROCOIN : Aerogel
 - <http://aerocoins.eu/>

- HIPIN : Aerogel
 - www.hipin.eu

- NANOINSULATE : VIP
 - www.nanoinsulate.eu

- FOAMBUILD : Nanofoam
 - www.foambuild.eu

- BUILD UP Web Seminar : Superinsulating materials: State of the art applications and long term performance -
<http://www.buildup.eu/news/38814>

- State of the Art of one decade of:
 - SIM development by industry
 - SIM applications in the building sector
- Experimental & Numerical Tools to provide reliable data (properties & durability)
 - Standards & Assessment
- Guideline for Secure Implementation
- Information about Sustainability of SIM
 - LCA, LCC
 - Embodied Energy (in agreement with Annex 57)

- To improve knowledge and confidence of end-users regarding SIM, mainly VIP & Nano-Porous materials such as Aerogel
- To foster a wider public acceptance of SIM in the future

■ **SUBTASK 1: State of the Art on Materials & Components - Case Studies**

- **SubTask Leader: ZAE Bayern (co-leader EMPA)**

- Action 1A : Materials & Characterization Methods
- Action 1B : Components & Systems
- Action 1C : Case Studies at the Building Scale

■ **SUBTASK 2: Characterization of materials & components - Laboratory Scale**

- **SubTask Leader: FIW Munich (Chalmers)**

- Action 2A : Materials Testing & Ageing Procedures (Experiments & Simulation)
- Action 2B : Components & Systems Testing (Experiments & Simulation)

- **SUBTASK 3: Practical Applications – Retrofitting at the Building Scale - Field scale**
 - **SubTask Leader: Chalmers University**
 - Action 3A : Mapping of the Use Conditions (Components & Systems)
 - Action 3B : Performance at the Building Scale (Experiments & Simulation)
 - Action 3C : Practical Applications focused on Retrofitting

■ SUBTASK 4: Sustainability – LCC, LCA, EE – Risk & Benefit

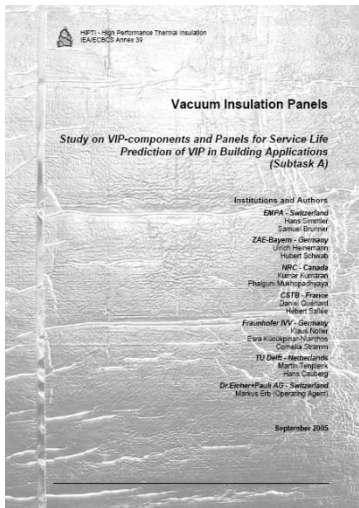
- **SubTask Leader : Quantis**
 - Action 4A: Life Cycle Assessment (LCA), including Embodied Energy (EE) –Annex 57
 - Action 4B: Life Cycle Cost Analysis (LCC)

- State of the Art on SIM (products & applications)
- Recommendations on methods and procedure to characterize SIM in lab. - Standards
- Recommendations on how to perform reliable testing of components and building integration
- Guideline of appropriate applications and implementation methods
- Sustainability Analysis

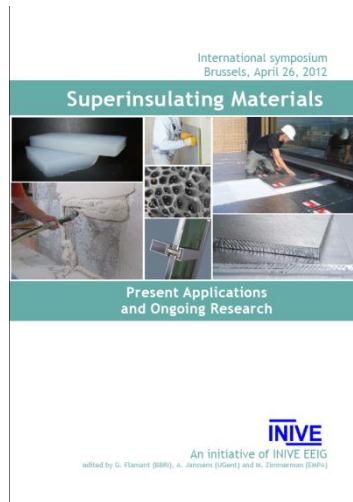
- ISO, CEN, UEATc, EOTA
- The Building Research Community
- Material, Component and System :
 - Manufacturers, Suppliers
- Engineering offices and consultants
- Building designers & Software developers
- Building contractors with an interest in high performance systems
- Energy providers

Participating Countries

- **Strong interest and high probability of funding:**
France, China, Germany, Italy, Korea, Norway, Spain, Sweden, Switzerland, Turkey, UK, Japan, Greece
- **Interested and in process to obtain funding:**
Canada, Belgium
- **Potential observer:**
Israel
- **Participation at the expert-meeting**
Netherlands



IEA Annex 39
 HIPTI : 2001-2005



INIVE-BBRI-EMPA
 2012

Preparation Phase

1st Expert Meeting
 Paris/ April 2013
 1st Annex Text

ExCo Meeting
 Rome/June 2013
 Annex65 – Text to be revised

2nd Expert Meeting
 Zurich/Nov. 2013

ExCo Meeting
 Dublin/Nov. 2013
 Annex65 – Revised Text

From mid-2014
 Working Phase
 To mid-2017



2005 2007 2009 2011 2012 2013 2014 2017

Zurich Wurzburg London Ottawa

Zurich

Nanjing

IVIS : International Vacuum Insulation Symposium

- You are welcome to contribute to the Annex

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