



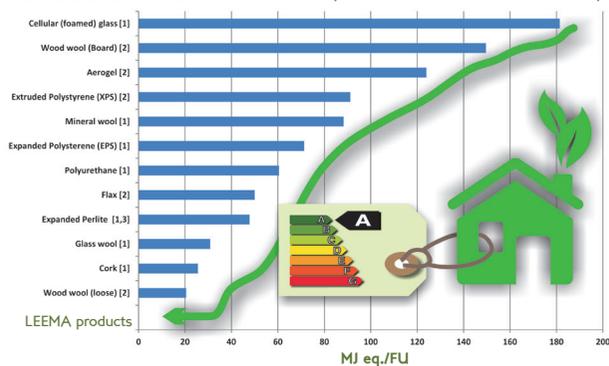
is a four-year long research project that aims to develop novel inorganic insulation materials and building insulation masonry components with low embodied energy. Raw materials are: silicate/alumino-silicate wastes of industrial minerals exploitation, recycled rejects from the glass industry and mineral wastes with high alkali content as alkali activators.

When measuring sustainability, the energy and resources used to create a building material and the building itself have to be taken into account as well. In fact, the overall environmental impact of the building sector can be reduced and the sustainability of buildings improved through the use of advanced building materials with low embodied energy.

### THE NEW MATERIALS:

- ♥ will be suitable for applications in both new and retrofitted buildings
- ♥ will have more than 50% lower embodied energy and at least 15% lower total cost, than the currently available solutions

### EMBODIED ENERGY PER FU (FU: m<sup>2</sup> insulation for Rvalue=1 m<sup>2</sup>K/W)



Embodied energy per FU was calculated using values of Embodied Energy (cradle to gate), density and thermal conductivity from:  
 [1] Inventory of Carbon & Energy (ICE) 3.6a, Hammond & Jones, 2008  
 [2] <http://www.greenspec.co.uk/>  
 [3] <https://perlite.org/>

### THE LEEMA PARTNERS:



Coordinator:  
S&B Industrial Minerals S.A, GR  
[www.sandb.com](http://www.sandb.com)



Etex Group (Redco), BE  
[www.etexgroup.com/](http://www.etexgroup.com/)  
[company/redco-nv-belgium](http://company/redco-nv-belgium)



Schlagmann Baustoffwerke GmbH&Co KG, DE  
[www.schlagmann.de](http://www.schlagmann.de)



National Technical University of Athens, GR  
[www.ntua.gr](http://www.ntua.gr)



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[www.dappolonia.it](http://www.dappolonia.it)



Morando, IT  
[www.keller.de/02en/05co/morando.html](http://www.keller.de/02en/05co/morando.html)



Institute of Materials Research and Testing at the Bauhaus University Weimar, DE / [www.mfpa.de](http://www.mfpa.de)



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Architects' Council of Europe CAE Services GEIE, BE / [www.ace-cae.eu](http://www.ace-cae.eu)



Belgian Building Research Institute (BBRI), BE  
[www.bbri.be](http://www.bbri.be)



Fenix TNT s.r.o, CZ / [www.fenixtnt.eu](http://www.fenixtnt.eu)



Fibran s.a, GR / [www.fibran.gr](http://www.fibran.gr)



Advanced Management Solutions Ltd, GR  
[www.amsolutions.gr](http://www.amsolutions.gr)



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# FORMED PRODUCTS

 **INORGANIC INSULATING INCOMBUSTIBLE**



## 3i FORMED PRODUCTS FOR ENERGY EFFICIENT BUILDINGS

3i Loose Filling materials and/or 3i Binders, based on mineral tailings, are used for the development of formed products like Fibre Boards, Foamed Blocks, Expanded Perlite Boards and Insulating Bricks.

The new products are called “3i” as they are Inorganic, Insulating and Incombustible, and have competitive properties and significantly reduced embodied energy and carbon footprint compared to their commercial counterparts.



## 3i BINDERS AND BOARDS

### 3i BINDERS

- ♥ Inorganic polymer pastes based on mineral wastes and industrial by-products
- ♥ Easy to shape using conventional methods such as casting or extrusion
- ♥ Good mechanical properties and low thermal conductivity
- ♥ Compatible with traditional aggregates and 3i LFMs
- ♥ Can be used to replace cementitious or clay-based binders for several applications
- ♥ Low embodied energy and carbon footprint

### 3i EPB BOARDS

for applications such as fire-proof roof insulation

- ♥ Based on a specially designed 3i LFM and inorganic binders
- ♥ Totally inorganic and therefore incombustible - No use of bituminous or fibrous materials
- ♥ Simple production process

### 3i FIBRE BOARDS

For interior or exterior applications where fire protection is required

- ♥ Expanded perlite is substituted by a specially designed 3i LFM
- ♥ Same production process as Fibre Cement Boards
- ♥ Similar density but increased flexural strength compared to traditional Fibre Cement Boards
- ♥ Lower thermal conductivity
- ♥ 3i binders could be used to replace cement, using moulding or extrusion as shaping methods

## 3i FOAMED BLOCKS, INSULATING BRICKS AND FACADES

### 3i FOAMED BLOCKS

for applications similar to lightweight concrete blocks, AAC or bricks.

- ♥ Inorganic - incombustible
- ♥ Exploitation of aluminosilicate/ silicate wastes, recycled materials, by-products
- ♥ Low thermal conductivity coefficient combined with good mechanical properties
- ♥ Energy efficient production process
- ♥ Compatibility with current manufacturing processes

### 3i INSULATING BRICKS AND FACADES

For application in new buildings or retrofitting

Expanded perlite is substituted by a specially designed 3i LFM

- ♥ Same production process as perlite-filled bricks
- ♥ Lower thermal conductivity due to the improved thermal properties of 3i LFM

3i binders as a replacement of the clay brick body:

- ♥ Highly innovative sustainable insulating bricks
- ♥ Similar production process, eliminating the energy consuming firing step, using extrusion as a shaping method
- ♥ Competitive properties compared to traditional bricks