Advanced Nanocomposite material in Efficient Building

Michele Andolfo

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Facts and figures about Selena Group

- Established in **1992**
- **30** companies in **17 countries**
- Sales to **70 countries worldwide**
- **1700** employees
- **42 000** customers and **millions** of end-users all over the world
- One of **top three** manufacturers of one-component polyurethane foam in the world
- Sales of **PLN 1 bn (EUR 239 m)** in 2015
AGNASIL – Description

➢ Development of acrylic and silicone sealants formulas with increased resistance to microbial corrosion.

➢ Formulas are based on aqueous nanosilver dispersion.

➢ The project is conducted with the cooperation TK Nano, Wroclaw University of Technology and Wroclaw University of Environmental and Life Sciences

This work is supported by funds from The National Center for Research and Development Applied Research Programme (PBS)
Nanoparticle dispersion

Waterbase nanoparticles solution

DLS diagram of nanoparticle size

TECHNICAL DATA FOR ACRYLIC SEALANT

Uncured - tested at 23 °C and 50% relative humidity value

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (ISO 2811-1) [g/ml]</td>
<td>1.03 ± 0.02</td>
</tr>
<tr>
<td>Skin forming time [min]</td>
<td>25 - 40</td>
</tr>
<tr>
<td>Tack free time [min]</td>
<td>40 - 50</td>
</tr>
<tr>
<td>Curing rate [mm/24h]</td>
<td>1 – 1.5</td>
</tr>
</tbody>
</table>

Cured - tested after 4 weeks at 23 °C and 50% relative humidity value

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secant modulus (ISO 8339) [MPa]</td>
<td>N/A</td>
</tr>
<tr>
<td>Movement accommodation (ISO 9047)</td>
<td>12.5%</td>
</tr>
<tr>
<td>Elongation at break (ISO 8339) [%]</td>
<td>≥ 100</td>
</tr>
<tr>
<td>Elastic recovery (ISO 7389) [%]</td>
<td>≥ 25</td>
</tr>
<tr>
<td>Shore A hardness (ISO 868)</td>
<td>≥ 20</td>
</tr>
</tbody>
</table>
Testing and lifetime

Determining the action of mold fungi to polymers:

EN ISO 846  Plastics - Evaluation of the action of microorganisms

E2149 − 13a  Standard Test Method for determining the Antimicrobial Activity of Antimicrobial Agents Under Dynamic Contact Conditions
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.

EENSULATE project

This project has received funding from European Union’s Horizon H2020 research and innovation programme under grant agreement No. 723868.
Focus on developing **solution for envelope insulation** to bring existing curtain wall buildings to “nearly zero energy” standards.
KEY PRODUCTS

EENSULATE FOAM
Highly insulating foam for the cost-effective manufacturing and insulation of the opaque components of curtain walls.

EENSULATE GLASS
A lightweight and thin double pane vacuum glass for the high insulation of the transparent component of curtain walls.

21 June 2017
KEY PRODUCTS

EENSULATE FOAM

Target properties

- Foam density: \( \leq 45 \text{ Kg/m}^3 \)
- Thermal conductivity: \( \leq 0.033 \text{ W/mK} \)
- Fire resistance: EN13501 (class B-s1-d0)
- Sound adsorption comparable to benchmark
- Production time decreased, easier than previous system
KEY PRODUCTS

EENSULATE FOAM

Lamellar powder in Polyurethane foams

- Filler properties: improve fire resistance,
  Different host group: from carbonate group to organic molecule as possible compatibiizer.
- Foam will have all three physical action
  - Cooling
  - Char
  - Dilution of radicals
The presence of the (003) reflection in PU-LDH\_CO$_3$ (sample 5) series at lower angle respect to that observed in the LDH-CO$_3$ denoted that a possible intercalated nanocomposite foam has been obtained [S. Gómez-Fernández et al. / Applied Clay Science 123 (2016) 109–120].
KEY PRODUCTS

EENSULATE FOAM

Target properties

In cooperation with Ulster University

In cooperation with Evonik

Lambda value

0.0245 W/mK
EENSULATE FOAM

Properties at month 10

- Foam density: 34 Kg/m$^3$
- Thermal conductivity: 0.0245 W/mK
- Fire resistance: Cone calorimeter ISO 5660 20-30 KW no ignition
- System can be easily used with standard PU technology

- 30-40% improvement in thermal efficiency
- The insulation element weight half
- Easier approach to design the facade

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Thank you for your attention!
Questions are welcome

Contact details:
Michele Andolfo
michele.andolfo@selena.com