Intelligent Temperature Management in an Extremely Lightweight Approach.

While today’s architecture is characterized by lightweight construction and by increasingly energy-optimized engineering as well, one is not required to do without whatever comfort may seem desirable: Building materials modified with Micronal®, phase change materials (PCM) ensure that ideal room air conditions are achieved through active temperature balancing, with no extra space or effort needed. Specifically in form of the gypsum wallboard Micronal® PCM SmartBoard™ phase change material can now be incorporated into innovative building concepts, readily and with effortless ease. Thus, intelligent temperature management becomes childishly simple for new building construction and refurbishment.
Micronal® PCM – Active Temperature Management in Buildings

A building material modified with Micronal® phase change materials is capable of running an active temperature management. Typically, it keeps the air temperature in office spaces and living rooms almost constant at the melting-point level throughout the period of phase change. Nature, through its day to night temperature differential, ensures a cycle sequence of ‘melt and solidify’, or ‘store and emit’, as applicable. Day-time peak temperatures are lessened, with low night-time temperatures used to dissipate heat from the building, at no charge.

Micronal® phase change materials are advantageous in that, while being low-weight items, they require little space in giving materials a high thermal-storage capacity. Thus, ordinary construction materials become functional components in the building. Moreover, they can be put into any shape, so bulky storage components are not needed any more, and the materials offer a great potential for decentralized large-area use throughout the building.

Phase Change Materials: High-Tech in Microcapsules

How it works:
Microscopically small polymer spheres contain in their core a storage medium of waxes. On heating and cooling, the wax in the reservoir capsules melts and solidifies, respectively. When the temperature rises, the phase changing materials absorb heat. When the temperature falls, they emit heat. During the phase change, the temperature remains constant. This stored heat which is ‘concealed’ in the phase change is known as latent heat. It is a reversible process which occurs within the melting range of the wax.

Once the room temperature rises to above melting temperature the microcapsules begin their ‘work’. Surplus heat is dissipated into the wall to be stored there. As a consequence, temperature peaks are cut off, thus ensuring a more uniform room temperature. So, there is an incredibly broad range of potential applications, specifically for thermal comfort during the summer season.
Temperature Management at Its Best: Micronal® PCM SmartBoard™

The Micronal® PCM SmartBoard™ represents the best-of-class solution in lightweight construction. Any square meter of this innovative building material includes three kilograms of latent heat storage material in the form of micro-capsules. These, for the first time, enable a wallboard to provide – in an active approach – a pleasant room air. In this way, indoor temperatures are optimized, in both new and refurbished buildings.

The heat-storage capacity of a 1.5 cm Micronal® PCM SmartBoard™ is comparable to that of a 9 cm concrete wall or a 12 cm brick wall: Intelligent temperature management in an extremely lightweight approach, in the truest sense of the word.

Customer’s benefits at a glance:
- Extended architectural freedom without compromising
- Easy to use, with no difference from a conventional building board or structural panel
- No extra space needed for the phase change material
- Reliable encapsulation technology optimized for incorporation into buildings
- As-new function for decades, with no added cost
- Reduces or completely restrains energy consumption of a conventional air-conditioning solution
- Enhances the building’s value
- Expertise issued by the globally leading chemical company

Haus der Gegenwart: Generating Ideas for the Future

In January 2005, the Haus der Gegenwart (Contemporary House) was opened in Munich in a ceremony. It was built in line with the concept of one of the award-winning models of the architecture contest started in 2001 by SZ Magazine of the German newspaper ‘Süddeutsche Zeitung’. Built in classical lightweight construction, the detached residential house incorporates innovative housing features, with a total of 600 m² of Micronal® PCM SmartBoard™ 23 used. Thus, 1,800 kg of pure phase change material warrant temperature management of the promising building which, perfectly tied into its environment, develops an allegorical symbiosis between an artificial environment and architecture.

Exacting demands on comfort and innovative building materials. www.haus-der-gegenwart.de

Heat Storage Capacity Comparison

- 1.5 cm Micronal® PCM SmartBoard™
- 9 cm Concrete wall
- 12 cm Brickwork

A Micronal® PCM SmartBoard™ only 1.5 cm thick features a thermal storage capacity identical to that of 9 cm concrete or 12 cm brickwork! Thus, it is the ideal building material for both refurbishment and modern lightweight construction.
The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out their own investigations and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed (05/2006).

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### Technical Data

#### Description

<table>
<thead>
<tr>
<th>Micronal® PCM SmartBoard™ 23</th>
<th>Micronal® PCM SmartBoard™ 26</th>
<th>Standard gypsum plaster board (for comparison)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>15 mm</td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>2,000 mm</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>1,250 mm</td>
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</tr>
<tr>
<td>Structure</td>
<td>Glassfiber nonwoven-covered gypsum wallboard with phase change material in the gypsum core</td>
<td></td>
</tr>
<tr>
<td>Edge design</td>
<td>Full squared</td>
<td></td>
</tr>
</tbody>
</table>

#### Parameter/Criterion

| 'Switching' temperature     | 23 °C                        | 26 °C                        | –                |
| Latent heat capacity ΔH     | approx. 330 kJ/m²            | approx. 330 kJ/m²            | 0 kJ/m²          |
| Specific heat capacity      | approx. 1.20 kJ/kgK          | approx. 1.20 kJ/kgK          | approx. 0.85 kJ/kgK |
| Thermal conductivity λ      | approx. 0.18 W/(mk)          | approx. 0.18 W/(mk)          | approx. 0.19 W/(mk) |

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1 Testing to the requirements laid down in DIN 18180  
2 Class B1 building material requirements are met through double-covering with a commercial 12.5 mm gypsum plaster board. Users are urged to comply with relevant statutory requirements relating to fire protection in buildings.

**Class B1 building materials:**  
Flame-retardant building materials for special structures

**Class B2 building materials:**  
Normally flammable building materials for buildings of ordinary type and for standard use

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3 Similar to DIN EN 12664/App. Lola 5