The value and sustainability of natural slate

R&D and sustainability in the mining sector

Conferencia Internacional
Green & Smart Mining Regions
Valladolid, 20\textsuperscript{th} March 2018

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1. CUPA INNOVACIÓN

2. LIFE CYCLE ASSESSMENT

3. SUSTAINABLE R&D PROJECTS
   i. GEOSTONE
   ii. THERMOSLATE
   iii. STONETACK

4. EUROPEAN LINES OF INTEREST
1. CUPA INNOVACIÓN

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4. EUROPEAN LINES OF INTEREST
The Division...
- R&D company of the Group
- Works jointly with other divisions of CUPA GROUP
- R&D and Innovation projects

Research Lines...
- Sustainability and revaluation of residues
- Innovative products with natural stone
- More efficient products and processes
- Industry 4.0

Chairmanship of the Sub committee CEN/TC 128/SC 8
“Slate and Stone products for roofing”

Collaboration in TASK 59 SHC
(International Energy Agency)

“Deep Renovation of historic buildings towards lowest possible energy demand and CO2 emission (NZEB)”
Products developed by CUPA INNOVACIÓN...
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Natural Slate as an **ECOLOGICAL & SUSTAINABLE** choice

- Water consumption: 0.165 L/m² slate
- Energy Consumption: 0.701 MJ/m² slate
- Atmospheric Pollution: 0.048 kg CO₂ eq/m² slate
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Premises for the R&D project...
- Production of slate residues
- Pollution associated to Portland cement

Background...
- Research field on Alkali Activated Cements → **GEOPOLYMERS**

**Precursor**
- Metakaolin
- Fly ash
- Blast furnace slag
- ...

**Activating Solution**
- NaOH
- Waterglass
- Silicates of Na or K
- ...

The R&D project...
- Aim of GEOSTONE: to develop **ECO-FRIENDLY** and **SUSTAINABLE** alkali activated cements from slate residues such as **SLATE POWDER**
Slate powder as a potential precursor...

- Fly ash
- Metakaolin
- Slate powder
- Granite powder

Some data...

- Revaluation of the residue
- Composition similar to other precursors
- Appropriate particle size

Characterization...

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Slate powder</th>
<th>Portland cement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressive strength</td>
<td>↑</td>
<td>↓</td>
</tr>
<tr>
<td>Chemical performance</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Freeze/thaw resistance</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>High Tº (1000ºC)</td>
<td>↑</td>
<td>↑</td>
</tr>
<tr>
<td>Environmental performance</td>
<td>↑</td>
<td>↓</td>
</tr>
</tbody>
</table>

Formulation of the Alkali Activated Cement...

**Precursor**
- Slate powder

**Activating Solution**
- Fly ash
- Metakaolin
- Slate powder
- Granite powder

**Arid Sand**
- OPC substitution

**Water**

Sustainable Products and Potential Uses

- Stonepanel GEO
- Precast concrete
- OPC substitution
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The product...

- Natural slate thermal panel
- DHW and pool heating
- Heat transmission \(\rightarrow\) Slate powder resin

Certifications...

Innovation & Sustainability...

- 2/3 less electricity/fossil fuel consumed
- Reduction in CO2 emissions
- Reduction of slate powder residue

Industrial protection...

- Slate resin
- Thermal panel
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3. iii. STONETACK

*The product...*

- Natural slate auto adhesive panel
- Less environmental impact for the slate process

*Sustainability thanks to...*

- Recovery of slate residues
- Less slate waste to dispose of
- Rejected slates separated while producing
- Factory close to production of slate waste

*Industrial protection...*
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H2020: NMBP, ITC y SC3
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THANK YOU FOR YOUR ATTENTION

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