Basalt fibers, advanced materials for various applications

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NordMin, information Day and Brokerage Event in Copenhagen, 13 November 2013
Basalt fibers
Advanced materials for various applications

Basalt fiber
Basalt roving
Basalt bar

Civil Engineering Laboratory sel.ru.is
BASALT FIBERS - MAIN ADVANTAGES

- tensile strength 20-25% higher than E-glass
- tensile modulus 15-20% higher than E-glass
- higher stiffness & strength in reinforced plastics
BASALT FIBERS - MAIN ADVANTAGES

- Higher mechanical properties and chemical resistance in both acid & alkali environment better than E glass
- Extended temperature range (up to 580°C)
- Environmental friendliness
- Easy recycling of Basalt Fiber Reinforced Plastics (BFRP) in comparison with GFRP
- Production cost of basalt-fibers is very low compared to other types of fibers.
- Basalt fiber properties significantly outperform E-glass and get close to specialty fibers like S-glass and carbon but at a lower price
GEOLOGICAL MAP OF THE NORTHEAST ATLANTIC REGION
SIMPLIFIED PRODUCTION PROCESS FOR BASALT FIBRE

1. sand silo
2. conveyor belt
3. batch charger
4. initial melting 1400-1600 C
5. precise melting, 1500° C
6. filament forming bushings
7. sizing applicator
8. strand formation
9. fibre tensioning
10. winding diameter 10-21 micron
Basalt-fibers in composite

- Basalt fibers have complex properties enabling them as replacement for asbestos, high strength glass, silica, chemical resistant glass and other special fibers in many applications.

- In a number of applications basalt fibers may be the best material due to unique combination of their physical and chemical properties.
BASALT FIBER BARS AS REINFORCEMENT

Non-corrosive reinforcement

High modulus of elasticity and excellent heat resistance

Bridge deck reinforced by Fiber bars

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Renovation of concrete columns by wrapping basalt fiber sheets
**STRENGTH OF COLUMNS**

- **Peak axial force**
  - **Súla** $F_c$ (kN)
    - CA0: 1129.5
    - CB0: 1076.7

- **Strain at peak stress**
  - **Súla** $\varepsilon_c$ (%)
    - CA0: 0.346
    - CB0: 0.343

- **Ultimate axial force (confined)**
  - **Súla** $F_{cc}$ (kN) $F_{cc}/F_c$
    - CA1: 971.2, 0.86
    - CB1: 1078.4, 1.0

- **Strain at ultimate stress**
  - **Súla** $\varepsilon_{cu}$ (%) $\varepsilon_{cu}/\varepsilon_c$
    - CA1: 0.783, 2.26
    - CB1: 0.711, 2.07
STRENGTH OF COLUMNS

Ultimate axial force (confined)

<table>
<thead>
<tr>
<th>Súla</th>
<th>F_{cc} (kN)</th>
<th>F_{cc}/F_{c}</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA2</td>
<td>1197,6</td>
<td>1,06</td>
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<tr>
<td>CB2</td>
<td>1497,2</td>
<td>1,39</td>
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Strain at ultimate stress

<table>
<thead>
<tr>
<th>Súla</th>
<th>ε_{cu} (%)</th>
<th>ε_{cu}/ε_{c1}</th>
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<tbody>
<tr>
<td>CA2</td>
<td>0,950</td>
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<td>CB2</td>
<td>1,014</td>
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Ultimate axial force (confined)

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<th>F_{cc}/F_{c}</th>
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<tbody>
<tr>
<td>CA3</td>
<td>1520,2</td>
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<td>CB3</td>
<td>1527,3</td>
<td>1,42</td>
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Strain at ultimate stress

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<th>ε_{cu}/ε_{c1}</th>
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</thead>
<tbody>
<tr>
<td>CA3</td>
<td>1,378</td>
<td>3,98</td>
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<tr>
<td>CB3</td>
<td>2,198</td>
<td>6,40</td>
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FIBERS IN COMPOSITE, SOME EXAMPLES