APPLICATION OF GEOPOLYMER AS A FIRE PROTECTION OF WOODEN BUILDINGS USING FOAMED GEOPOLYMER COMPOSITE

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COMPOSITION OF THE TEAM
This work aims at evaluating the performance under thermal loading of geopolymer composite for passive fire protection of the OSB panels.

On the OSB were coated by geopolymers layer which 2 thickness sizes.

Fire testing was conducted on the OSB panels 500 x 500 x 20 mm by flame of a gas burner into a furnace and the test was performed at the age of 21 days after the production of the specimens.
Geopolymer product, supplied by České lupkové závody, Czech Republic, are inorganic two components aluminosilicate binder based on metakaolin and potassium alkaline solution. Aluminum powder with a particle size of 45 µm and was used for foaming. Silicious sand with a particle size of 500 µm and waste basalt fiber.

Raw materials for production geopolymer composite layer on panels
## MATERIALS AND EXPERIMENT DETAILS

<table>
<thead>
<tr>
<th>Samples</th>
<th>sand/binder</th>
<th>binder/liquid</th>
<th>basalt fiber/cement [%]</th>
<th>% wt. Al</th>
<th>Geo. layer thickness [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No. 2</td>
<td>1</td>
<td>0.9</td>
<td>30</td>
<td>0.25</td>
<td>8-10</td>
</tr>
<tr>
<td>No. 3</td>
<td>1</td>
<td>0.9</td>
<td>30</td>
<td>0.25</td>
<td>18-20</td>
</tr>
<tr>
<td>No. 4</td>
<td>-</td>
<td>0.9</td>
<td>60</td>
<td>2.5</td>
<td>8-10</td>
</tr>
<tr>
<td>No. 5</td>
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<td>0.9</td>
<td>60</td>
<td>2.5</td>
<td>18-20</td>
</tr>
</tbody>
</table>
EXPERIMENT

Figs shows the sample arrangement for fire exposure. The specimen was inserted into door of the furnace and the flame intensity was applied by controlling the flow of gas.
EXPERIMENT
RESULTS

Sample 1: without geopolymer layer

Temperature [°C]

Time [sec]

Sensor inside
Sensor outside
Sensor in the chimney
RESULTS

Sample 2: 0.25% al; 30% basalt-fiber waster; 100% of find sand; layer thickness 8-10 mm.

Sample 3: 0.25% al; 30% basalt-fiber waster; 100% of find sand; layer thickness 18-20 mm.
RESULTS

Sample 4: 2.5% Al, 60% basalt-fiber waste; without sand; layer thickness 8-10mm

Sample 5: 2.5% Al; 60% basalt-fiber waste; without sand; layer thickness 18-20mm
RESULTS

OSB panel without a geopolymer layer (sample 1)

OSB panel with a geopolymer layer (sample 3)
CONCLUSIONS

- The experiment describes the fire testing of OSB panels with a geopolymer layer and without them. They were proceeded testing after 21 days. The result showed that
  - OSB panel without a geopolymer layer could withstand around 20 minutes.
  - OSB panel with a geopolymer layer could keep in the time period: Sample 2 (50 minutes); Sample 3 (40 minutes); Sample 4 (50 minutes) and Sample 5 (100 minutes).
- Results of experimental confirmed more about applying of geopolymer for thermal insulation purpose and it can be used as great building material for fire-resistance.
- 1 m² ~ 3 €
THANK YOU FOR YOUR ATTENTION

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