

Evaluation of the Efficacy of Surface Hydrophobisation and Properties of Composite Based on Lime Binder with Flax Fillers

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Abstract : The aim of the study was to evaluate the possibility of applying modified lime binder together with natural flax fibers and straw to the production of wall blocks to the usage in energy-efficient construction industry and the development of proposals for technological solutions. The following laboratory tests were performed: the analysis of the physical characteristics of the tested materials (bulk density, total porosity, and thermal conductivity), compressive strength, a water droplet absorption test, water absorption of samples, diffusion of water vapor, and analysis of the structure by using SEM. In addition, the process of surface hydrophobisation was analyzed. In the paper, there was examined the effectiveness of two formulations differing in the degree of hydrolytic polycondensation, viscosity and concentration, as these are the factors that determine the final impregnation effect. Four composites, differing in composition, were executed. Composites, as a result of the presence of flax straw and fibers showed low bulk density in the range from 0.44 to 1.29 kg/m³ and thermal conductivity between 0.13 W/mK and 0.22 W/mK. Compressive strength changed in the range from 0.45 MPa to 0.65 MPa. The analysis of results allowed observing the relationship between the formulas and the physical properties of the composites. The results of the effectiveness of hydrophobisation of composites after 2 days showed a decrease in water absorption. Depending on the formulation, after 2 days, the water absorption ratio WH of composites was from 15 to 92% (effectiveness of hydrophobization was suitably from 8 to 85%). In practice, preparations based on organic solvents often cause sealing of surface, hindering the diffusion of water vapor from materials but studies have shown good water vapor permeability by the hydrophobic silicone coating. The conducted pilot study demonstrated the possibility of applying flax composites. The article shows that the reduction of CO₂ which is produced in the building process can be affected by using natural materials for the building components whose quality is not inferior as compared to the materials which are commonly used.

Keywords : ecological construction, flax fibers, hydrophobisation, lime

Conference Title : ICCESE 2016 : International Conference on Civil, Environmental and Structural Engineering

Conference Location : Kuala Lumpur, Malaysia

Conference Dates : February 11-12, 2016