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Assessment Of The Thermal And Mechanical Properties Of Bio-based Composite Materials For Thermal Insulation

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Abstract : Composite materials have come to the fore a few decades ago because of their superior insulation performances. Recycling natural fiber composites and natural fiber reinforcement of waste materials are other steps for conserving resources and the environment. This paper reviewed the Thermal properties (Thermal conductivity, Effusivity, and Diffusivity) and Mechanical properties (Compressive strength, Flexural strength, and Tensile strength) of bio-composite materials for thermal insulation in the construction industry. For several years, the development of the building materials industry has placed a special emphasis on bio-source materials. According to recent studies, most natural fibers have good thermal insulating qualities and good mechanical properties. To determine the thermal and mechanical performance of bio-composite materials in construction most research used experimental methods. the results of the study show that these natural fibers have allowed us to optimize energy consumption in a building and state that density, porosity, percentage of fiber, the direction of heat flow orientation of the fiber, and the shape of the specimen are the main elements that limit the thermal performance and also showed that density, porosity, Type of Fiber, Fiber length, orientation and weight percentage loading, Fiber-matrix adhesion, Choice of the polymer matrix, Presence of void are the main elements that limit the mechanical performance of the insulation material. Based on the results of this reviewed paper Moss fibers (0.034W/ (m. K)), Wood Fiber (0.043 W/ (m. K)), Wheat straw (0.046 W/ (m. K), and corn husk fibers (0.046 W/ (m. K) are a most promising solution for energy efficiency for construction industry with interesting insulation properties and with good acceptable mechanical properties. Finally, depending on the best fibers used for insulation applications in the construction sector, the thermal performance rate of various fibers reviewed in this article are analyzed. Due to Typha's high porosity, the results indicated that Typha australis fiber had a better thermal performance rate of 89.03% with clay.

Keywords : bio-based materials, thermal conductivity, compressive strength, thermal performance
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