

Sustainable masonry retrofitting system

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The majority of masonry buildings in Italy are highly susceptible to natural disasters, particularly seismic activities. Most of these buildings were constructed before 1990 and do not strictly adhere to structural and energy standards. Current standards and building codes require both old and new buildings to be upgraded or strictly adhere to structural and energy norms to ensure safety, energy efficiency, and comfort.

This study emphasizes the importance of using natural fibers and composite materials in the construction and building sector.

Natural fiber jute has been used to prepare composite mortars. The mechanical and thermal properties of the normal and composite mortars have been analyzed through flexural and compressive strength tests, and thermal conductivity tests.

During this research, we have fabricated composite mortars using jute fibers of varying lengths (30mm, 10mm, and 5mm) and different fiber percentages (2.0%, 1.5%, 1.0%, and 0.5%) in relation to the mortar masses. When subjected to flexural and compression tests, unreinforced mortar samples demonstrated brittle failure with an hourglass shape. Conversely, the fiber-reinforced mortar samples displayed enhanced ductility and strain energy but reduced strength. Furthermore, increased fiber percentage resulted in improved thermal resistance in the composite samples. Notably, the longer fibers (30 mm in all fiber percentage categories) exhibited greater capacity to dissipate mechanical energy, while the shorter fibers showcased lower thermal conductivity, thereby enhancing the insulation capabilities of the composite samples.



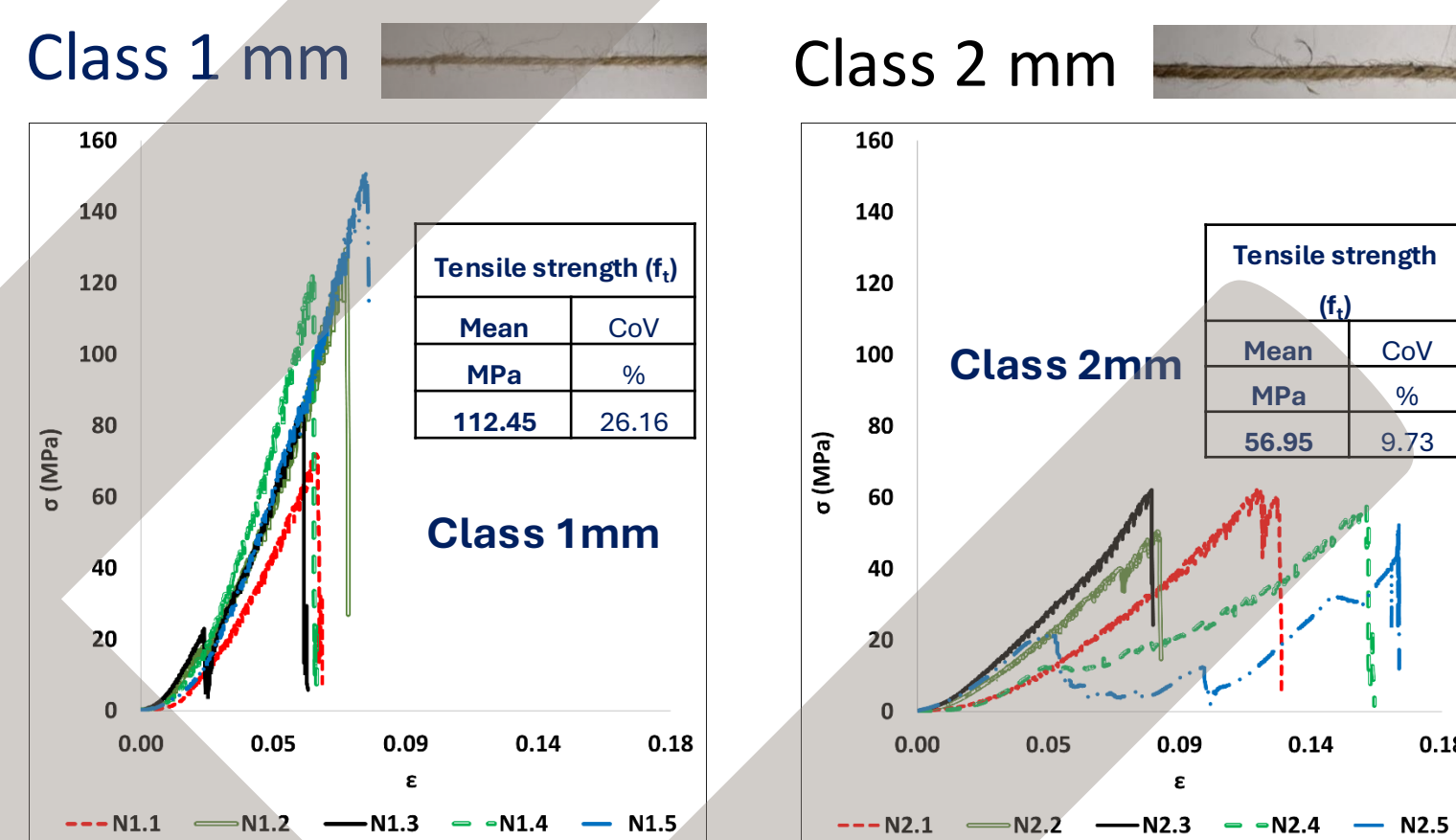
Advantages of Jute Fiber

- Natural fiber
- Abundantly available
- Cheap
- Biodegradability
- Recyclability
- Lower risk to humans and nature
- Second most produced natural fiber

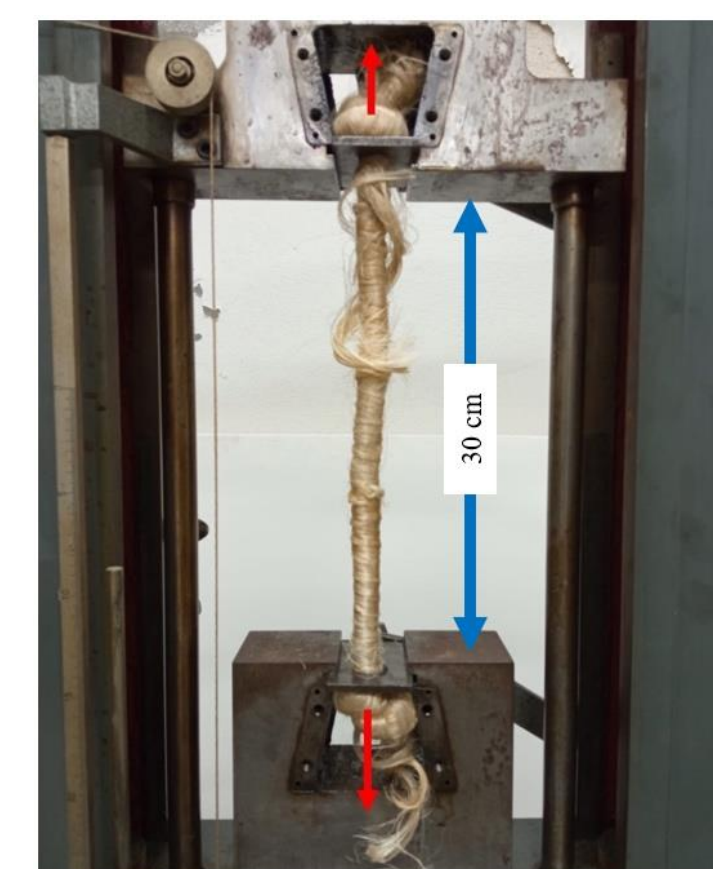


30 mm 10 mm 5 mm

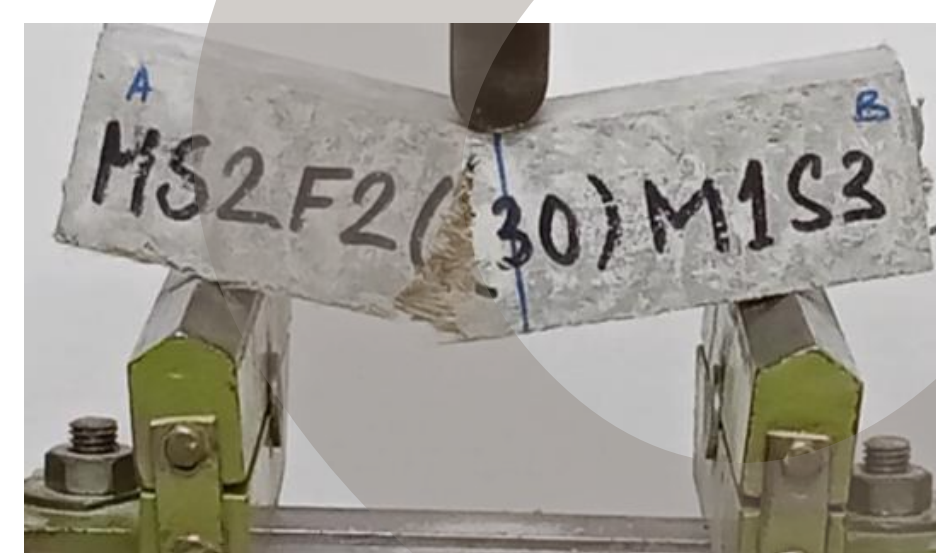
Chopped jute fibers



Jute threads and tensile strength tests



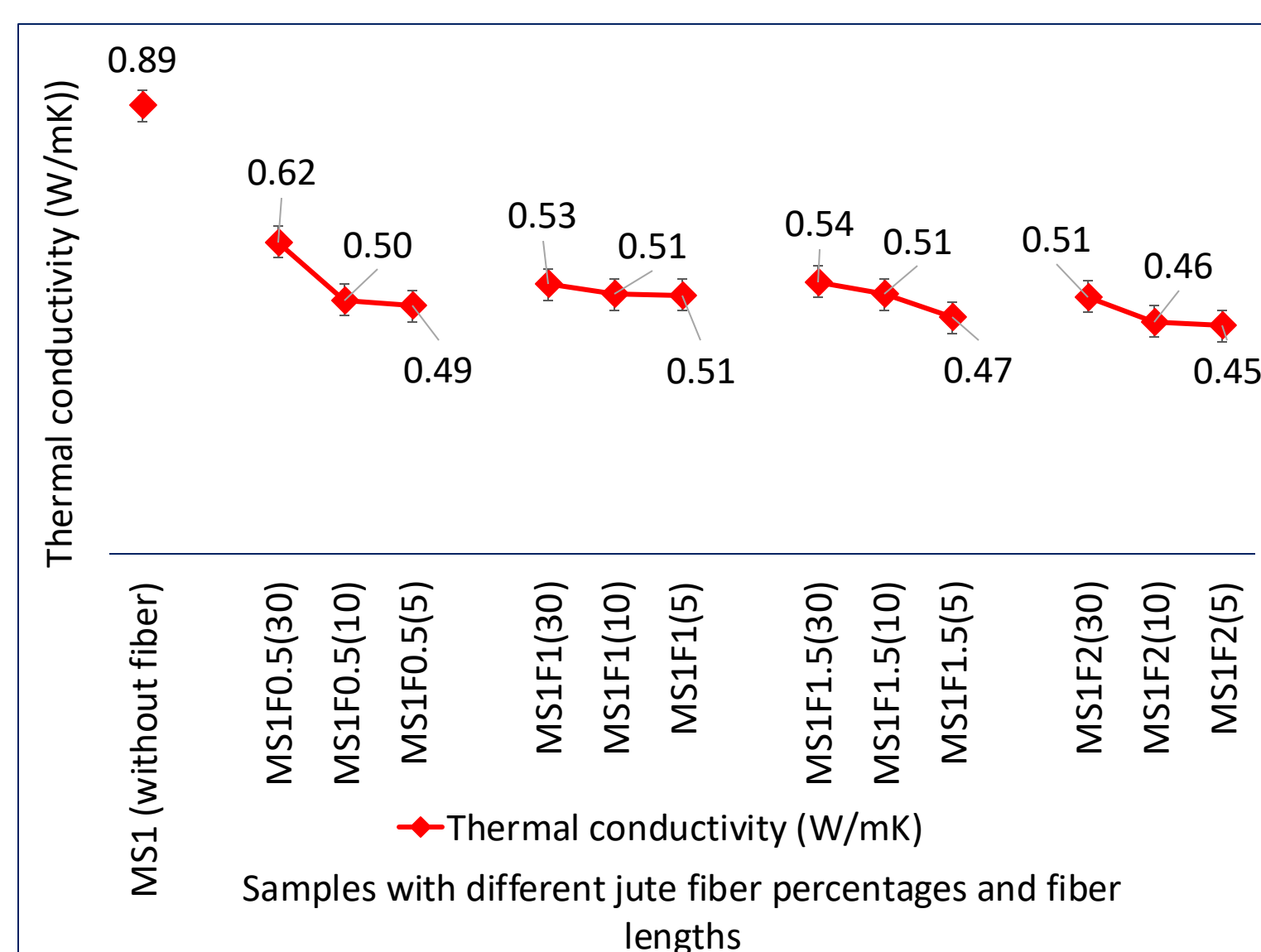
Jute diatom and tensile strength tests



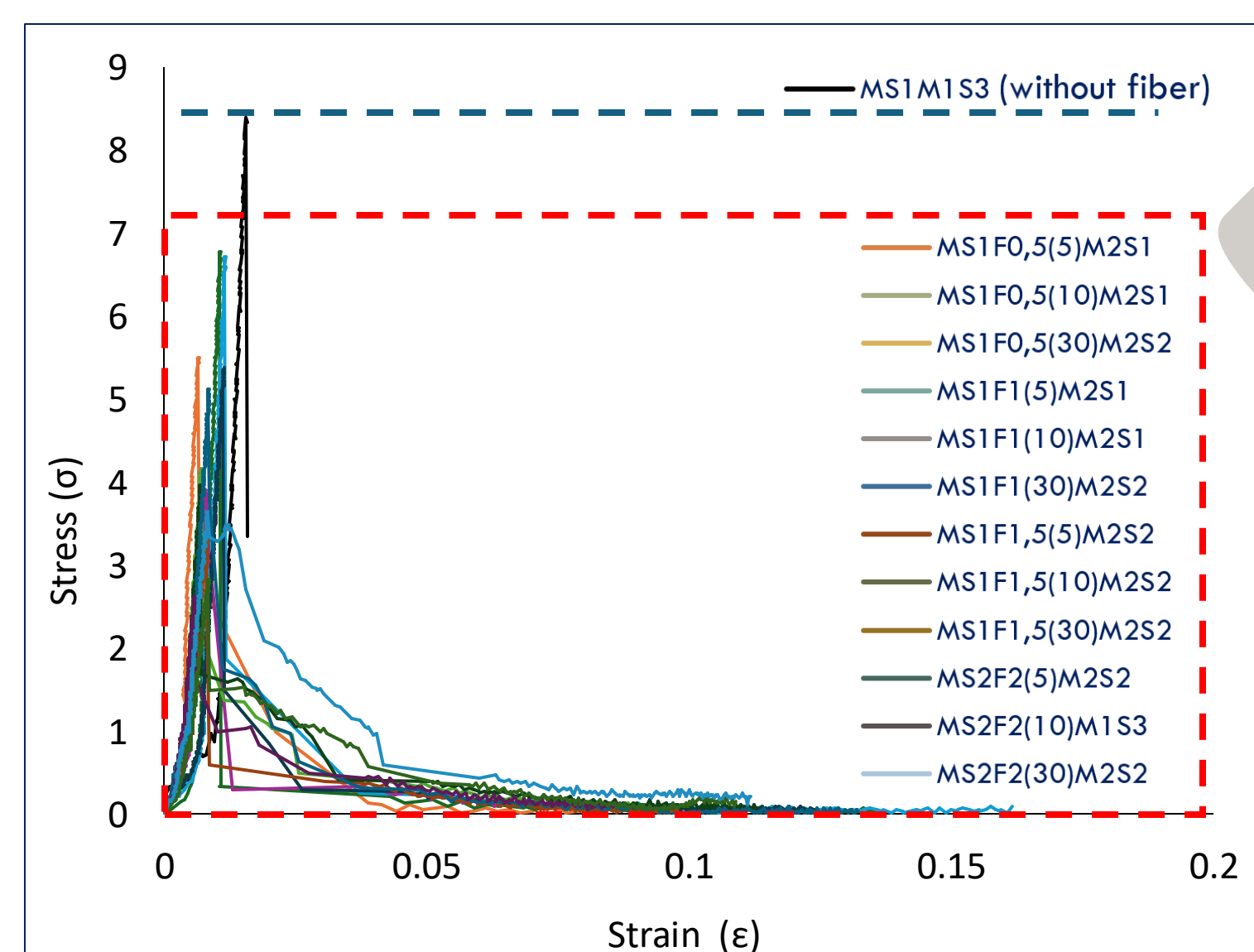
Flexural strength tests: Samples without and with fiber

Compressive strength tests: Samples without and with fiber

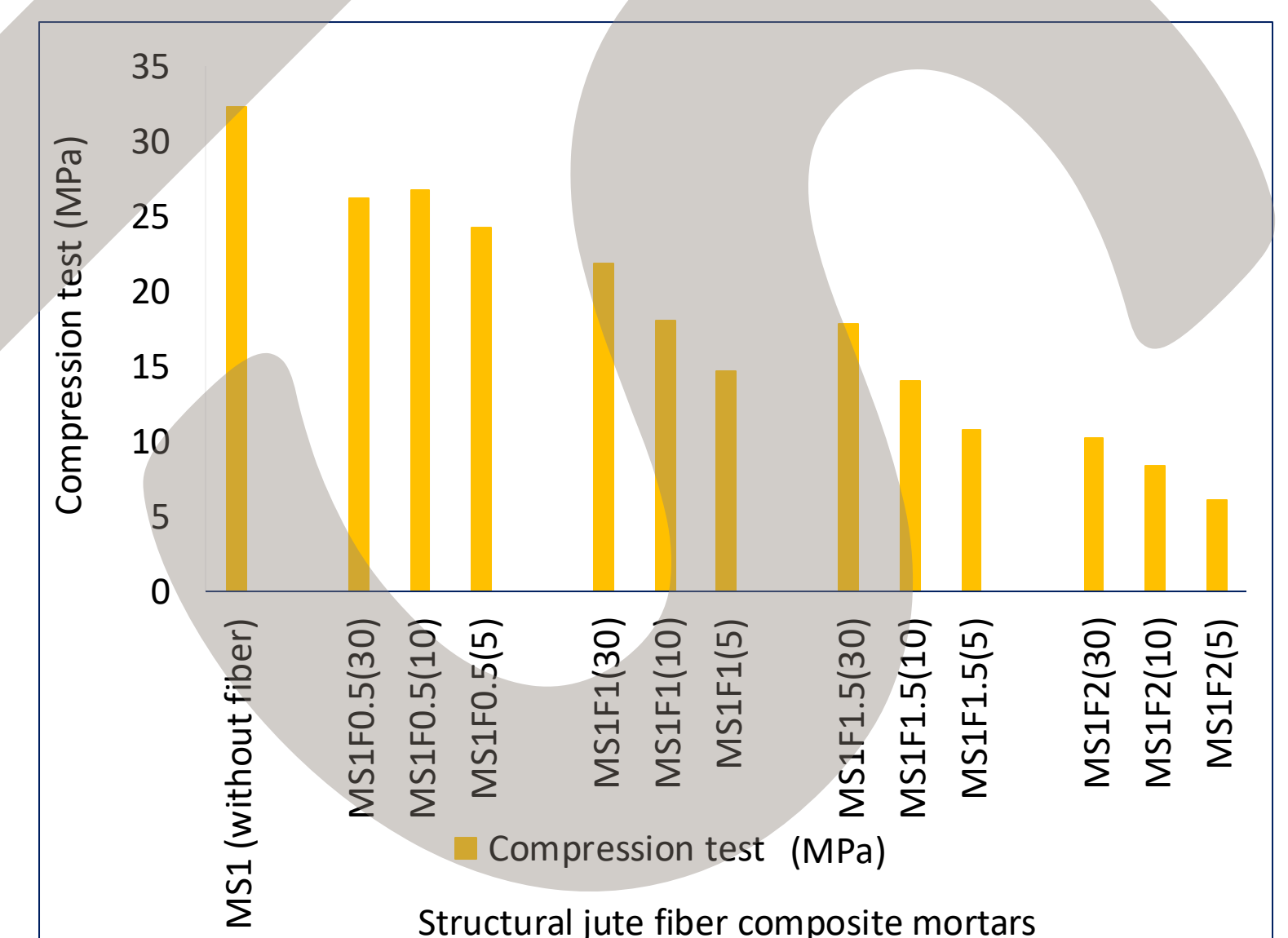
Heat flow meter and Thermal conductivity test



Thermal conductivity test result



Flexural strength test result



Compressive strength test result

References:

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