

<https://doi.org/10.7250/CONNECT.2024.087>

SOUND ABSORPTION EVALUATION AND ANALYSIS OF DIFFERENT HEMP FIBER TYPES

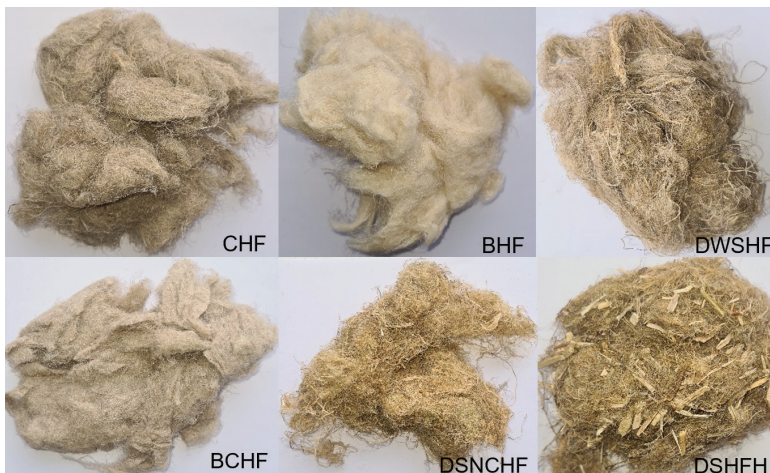
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Abstract – In recent years, the global conversation surrounding sustainable practices and environmentally friendly alternatives has gained significant momentum. Hemp fiber presents a compelling alternative to conventional sound-absorbing materials, such as fiberglass, foam, and mineral wool. Hemp fiber offers a plethora of positive environmental aspects from mitigating deforestation to reducing carbon emissions. In this study, six different types of hemp fiber samples were tested: bleached hemp fiber (BHF), cottonized hemp fiber (CHF), boiled cottonized hemp fiber (BCHF), decorticated well stripped hemp fiber (DWSHF), decorticated short, not combed hemp fiber (DSNCHF) and decorticated short hemp fiber with 40 % hurds (DSHFH). The sound absorption was measured using the impedance tube, transfer function method in accordance with ISO 10534-2 standard. The hemp fiber samples were changed in thickness of 20 mm, 40 mm, 60 mm and density from 50 kg/m³ to 250 kg/m³ in steps of 50 kg/m³. It has been found out that all of hemp fiber types absorbs sounds of medium (600–2000 Hz) and high (2500–5000 Hz) frequencies very well. The sound absorption coefficient reaches up to 0.99 at medium and high frequencies. Absorption peaks occur at frequencies of 1000 Hz, 1250 Hz, 1600 Hz, 2500 Hz, 3150 Hz, 4000 Hz, 5000 Hz, depending on the measured fiber thickness, density, and type of measured fiber. It has been determined that in all cases, increasing the thickness of the hemp fiber sample increases sound absorption at lower frequencies. Sound absorption at lower frequencies also generally increases when using denser fibers, but this also depends on the type of hemp fiber being studied. Peaks in the sound absorption coefficient of 0.96–0.99 were mostly achieved when testing fibers with density of 50 kg/m³, 100 kg/m³, and 150 kg/m³.

Keywords – Hemp; natural fibers; sound absorption coefficient; sound absorbing materials



Types of hemp fibers studied (cottonized h.f., bleached h.f., decorticated h.f. (well stripped), boiled cottonized h.f., decorticated h.f. (short, not combed), f – decorticated short h.f. with 40 % hurds).