The Potential of Selected Agricultural Wastes as Sound Absorber and Thermal Insulator Based on Their Surface Morphology

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Natural fibrous materials have been studied to address noise and high heat indices. Many studies did not sufficiently support claims of better acoustical and heat insulating materials. Thus, this study investigated the surface morphology of easily available agricultural materials like coconut husks, banana pseudostem and sugarcane husk for their potential as sound absorber and thermal insulator. Fiber pads from the materials were constructed and analyzed for noise reduction coefficients, thermal insulating performance, water absorbing capacity and flame tolerance using the methods specified in the American Society for Testing Materials. Scanning electron microscopy was used for analytical imaging of the agricultural materials. The morphology of the coconut husk revealed more diverse microporous cells with varying shapes and sizes compared to that of sugarcane husk and banana pseudostem. Noise reduction coefficients (0.80dB and 0.92dB), (0.75dB and 0.78dB) and (0.50dB and 0.35dB) each at 800Hz and 440Hz, and heat reductions of 2.560C, 1.710C, and 1.240C were obtained from coconut husk, sugarcane husk and banana pseudostem, respectively. The coconut husk gave the highest water absorbing capacity and high flame tolerance of 56% compared to that of sugarcane husk (49%) and banana pseudostem (32.67%). Results indicate that porosity affects the noise and heat reduction indices of the fibers. The more porous the material is, the better its potential as sound absorber and thermal insulator.

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