

**USE OF SELECTED AGRICULTURAL WASTE MATERIALS FOR SOUND ABSORPTION APPLICATIONS**

**H.M.I.S. Senevirathne, B.M.K. Pemasiri and P.W.S.K. Bandaranayake\***

*Department of Physics, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka*  
*\*kumarab@pdn.ac.lk*

Agricultural and industrial dry waste materials accumulated in large quantities have become environmental pollutants. The present research project was focused on utilizing waste materials as sound absorbing materials for building walls, giving waste a value addition. Paddy straw, rice husk, coconut coir, jaggery pith and saw dust were selected as raw materials. Weighed 95% of dry waste material was thoroughly mixed with 5% Chemifix as a binding agent. The mixture was filled to a metal mould and 500 N was applied for 1 hour to make 1 cm thick sheets of size 28×20 cm<sup>2</sup> and dried in air for 5-7 days. A sound test box was constructed and one surface was covered with the sample sheets. Sound waves of frequency range from 250 Hz to 2000 Hz were generated, amplified and fed to a speaker. The sound reflection and transmission were measured using a sound level meter from 30 dB to 130 dB range, and used for calculation of sound absorption coefficients. The variation of sound absorption properties with thickness were also measured. Further, the density and modulus of rupture were measured to identify the strength of the materials. Jaggery pith waste sheets with modulus of rupture of  $5.1 \times 10^6$  N m<sup>-2</sup> and density of 467 kg m<sup>-3</sup> showed the highest sound absorption coefficient,  $\alpha = 0.12$  at 1000 Hz for 1 cm thickness. The sheets made from rice husk showed the lowest  $\alpha = 0.07$  among the selected waste materials. Thus, all the material sheets are suitable as insulation boards without using a backing sheet as they are strong enough. Jaggery pith sheets of 2.0 cm thickness show  $\alpha = 0.22$ , which is comparable to the commercially available 1.4 cm thick cork floor-tiles with  $\alpha = 0.25$  at 1000 Hz. Hence, these waste materials can be used as an alternative substitute for acoustical insulation.

**Keywords:** Acoustical insulation, Agricultural dry waste, Modulus of rupture, Sound absorption, Sound test box