

## **Acoustic characteristic of bio-composite micro-perforated panel (BC-MPP) backed with natural fiber**

### **Abstract**

We investigated the sound absorption properties of a bio-composite microperforated panel (BC-MPP) with a combination of backed-structure and several types of natural fibers such as loofah, kapok, and coconut coir. The sound absorption coefficient (SAC) of different combinations of natural fibers samples was obtained by using a two-microphone impedance tube. In addition, three models, including Delany-Bazley model, Maa theory, and electroacoustical analogy, were employed to estimate the SAC value of natural fiber, BC-MPP, and BC-MPP with a backed structure, respectively. The experimental results demonstrate that the SAC value was increased to almost 0.99 as compared to BC-MPP alone when natural fiber was introduced at the back of BC-MPP either by insertion in the hole of backed structure or attached directly at the back of BC-MPP. The SAC peak also shifted to a lower frequency bandwidth with the highest peak obtained at 930 Hz, 800 Hz and 640 Hz for MPP with coconut husk, BC-MPP with kapok and BC-MPP with loofah, respectively. The absorption frequency was also observed slightly wider than BC-MPP without natural fiber. In comparison of BC-MPP with loofah and BC-MPP with others natural fibers, the insertion of kapok and coconut coir in the hole of backed structure provides a wider effective sound absorption coefficient. The comparison of experimental result with the theoretical calculation shows that the SAC obtained from experiment provides higher SAC value over the theoretical model for both BC-MPP and BC-MPP backed structure. © 2023, The Korean Society of Mechanical Engineers and Springer-Verlag GmbH Germany, part of Springer Nature.

### **Keywords**

Backed structure; Bio-composite micro perforated panel; Impedance tube; Natural fiber; Sound absorption coefficient