

Appendix A. Octave Band Analysis and Theoretical Validation

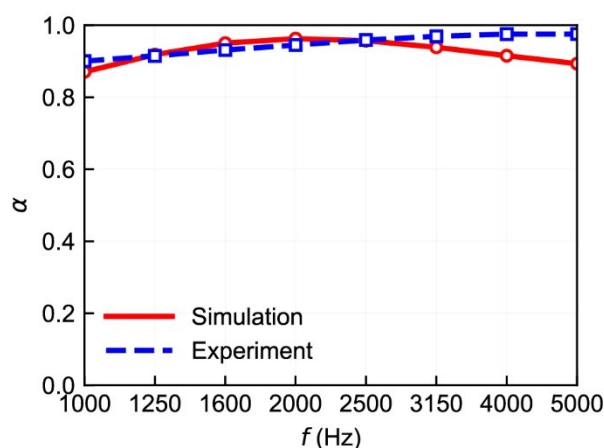


Fig A1 Comparison of sound absorption coefficients in one-third octave bands.

To better align with practical engineering applications and validate the accuracy of the theoretical model used in this study, the experimental sound absorption coefficients were converted into one-third octave band representations according to international standards and compared with theoretically predicted values in the frequency range of 1000–5000 Hz. The comparative results are shown in Figure A1.

As can be seen from Figure A1, the experimentally obtained one-third octave band absorption curve agrees well with the theoretical prediction in its overall trend within the frequency range of interest. The two curves exhibit similar variations and characteristics across the entire band, indicating that the theoretical model effectively captures the sound absorption properties of the material. Although certain numerical differences can be observed at specific frequencies, these discrepancies do not affect the consistency of the overall trend.

These results demonstrate that the experimental methodology employed in this study is reliable and that the obtained data effectively reflect the acoustic performance of the material. Meanwhile, the theoretical model shows reasonable predictive capability within this frequency range, and its overall trend corresponds well with the experimental results, providing valuable reference for further engineering applications and design optimization. The general agreement between the theoretical model and experimental data lays a solid foundation for subsequent research and indicates that the approach has certain applicability in engineering practice.