

The Design Optimization for Sound Absorption Material of Multi-Layer Structure

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Abstract : Sound absorbing material is used as automotive interior material. Sound absorption coefficient should be predicted to design it. But it is difficult to predict sound absorbing coefficient because it is comprised of several material layers. So, its targets are achieved through many experimental tunings. It causes a lot of cost and time. In this paper, we propose the process to estimate the sound absorption coefficient with multi-layer structure. In order to estimate the coefficient, physical properties of each material are used. These properties also use predicted values by Foam-X software using the sound absorption coefficient data measured by impedance tube. Since there are many physical properties and the measurement equipment is expensive, the values predicted by software are used. Through the measurement of the sound absorption coefficient of each material, its physical properties are calculated inversely. The properties of each material are used to calculate the sound absorption coefficient of the multi-layer material. Since the absorption coefficient of multi-layer can be calculated, optimization design is possible through simulation. Then, we will compare and analyze the calculated sound absorption coefficient with the data measured by scaled reverberation chamber and impedance tubes for a prototype. If this method is used when developing automotive interior materials with multi-layer structure, the development effort can be reduced because it can be optimized by simulation. So, cost and time can be saved.

Keywords : sound absorption material, sound impedance tube, sound absorption coefficient, optimization design

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