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Research on the Two-Way Sound Absorption Performance of Multilayer Material

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Abstract : Multilayer materials are applied to much acoustics area. Multilayer porous materials are dominant in room absorber. Multilayer viscoelastic materials are the basic parts in underwater absorption coating. In most cases, the one-way sound absorption performance of multilayer material is concentrated according to the sound source site. But the two-way sound absorption performance is also necessary to be known in some special cases which sound is produced in both sides of the material and the both sides especially might contact with different media. In this article, this kind of case was research. The multilayer material was composed of viscoelastic layer and steel plate and the porous layer. The two sides of multilayer material contact with water and air, respectively. A theory model was given to describe the sound propagation and impedance in multilayer absorption material. The two-way sound absorption properties of several multilayer materials were calculated whose two sides all contacted with different media. The calculated results showed that the difference of two-way sound absorption coefficients is obvious. The frequency, the relation of layers thickness and parameters of multilayer materials all have an influence on the two-way sound absorption coefficients. But the degrees of influence are varied. All these simulation results were analyzed in the article. It was obtained that two-way sound absorption at different frequencies can be promoted by optimizing the configuration parameters. This work will improve the performance of underwater sound absorption coating which can absorb incident sound from the water and reduce the noise radiation from inside space.

Keywords : different media, multilayer material, sound absorption coating, two-way sound absorption
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