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Sound Performance of a Composite Acoustic Coating With Embedded Parallel Plates Under Hydrostatic Pressure

Authors : Bo Hu, Shibo Wang, Haoyang Zhang, Jie Shi

Abstract : With the development of sonar detection technology, the acoustic stealth technology of underwater vehicles is facing severe challenges. The underwater acoustic coating is developing towards the direction of low-frequency absorption capability and broad absorption frequency bandwidth. In this paper, an acoustic model of underwater acoustic coating of composite material embedded with periodical steel structure is presented. The model has multiple high absorption peaks in the frequency range of 1kHz-8kHz, where achieves high sound absorption and broad bandwidth performance. It is found that the frequencies of the absorption peaks are related to the classic half-wavelength transmission principle. The sound absorption performance of the acoustic model is investigated by the finite element method using COMSOL software. The sound absorption mechanism of the proposed model is explained by the distributions of the displacement vector field. The influence of geometric parameters of periodical steel structure, including thickness and distance, on the sound absorption ability of the proposed model are further discussed. The acoustic model proposed in this study provides an idea for the design of underwater low-frequency broadband acoustic coating, and the results shows the possibility and feasibility for practical underwater application.

Keywords : acoustic coating, composite material, broad frequency bandwidth, sound absorption performance
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