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Gyani Shankar Sharma, Alex Skvortsov, Ian MacGillivray, Nicole Kessissoglou

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Sound transmission through a periodically voided soft elastic medium submerged in water

Gyani Shankar Sharma^{a,*}, Alex Skvortsov^b, Ian MacGillivray^b,
Nicole Kessissoglou^a

^a*School of Mechanical and Manufacturing Engineering, UNSW Australia, Sydney, 2052, Australia*

^b*Maritime Division, Defence Science and Technology Group, Melbourne, 3207, Australia*

Abstract

Analytical and numerical models are developed to study sound transmission through a periodically voided soft elastic medium submerged in water. The analytical model is based on homogenization theory which allows modelling of the voided material as a homogeneous material using effective material parameters. The numerical model is based on the finite element method. A single layer of voids as well as multiple layers of voids along the direction of propagation of sound are considered. Attenuation of sound pressure is attributed to the monopole type resonance of the voids. The effect of strong and weak coupling of void resonances on the transmission characteristics is presented. Strong coupling of resonance of voids is shown to result in broadband attenuation of sound. The advantages and limitations associated with each predictive technique are briefly discussed.

Keywords: Periodic voids, Elastic medium, Monopole resonance, Sound transmission

*Corresponding author

Email address: gyanishankar.sharma@unsw.edu.au (Gyani Shankar Sharma)

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