

Sound-impenetrable holes in water based on acoustic complementary medium

CHENKAI LIU¹†, PING BAI¹† and YUN LAI¹*

¹College of Physics, Optoelectronics and Energy & Collaborative Innovation Center of Suzhou Nano Science and Technology, Soochow University, Suzhou 215006, China

*corresponding author: laiyun@suda.edu.cn

Abstract-By designing a two-dimension acoustic complementary medium of water, we demonstrate the possibility of realizing a sound-impenetrable hole that can block acoustic waves in water. The complementary medium is composed of core-shell rubber cylinders in a square lattice, and possesses the exact negative values of water in both the effective density and bulk modulus at a working frequency. The effects of negative refraction as well as the sound-impenetrable hole are verified by numerical simulations. Interestingly, by introducing a small amount of loss, we find that the functionality of such a sound-impenetrable hole becomes robust and works in a broad frequency range.