基于丁腈橡胶帽封装的MEMS仿生水听器的设计

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摘　要：

针对现有封装结构会对灵敏度造成一定程度的损失，使现有水听器的灵敏度小于水听器芯片裸测灵敏度的问题，本文改用了透声性能好、耐腐蚀的丁腈橡胶(NBR)制作的透声帽，并对现有的矢量水听器的封装外壳进行相应的优化设计。该封装结构的水听器的共振频率降低到50HZ以下，水听器所感兴趣的频段（50-4KHz）不会受到封装谐振的干扰，拓宽了水听器的工作频率。该封装的灵敏度提高到几乎与裸片的灵敏度一致，达到-170dB（±2dB），并优化金属管壳的圆盘的尺寸，即水听器最大径，由36mm缩小至28mm，使水听器的封装进一步小型化。

关键词：MEMS仿生水听器；封装；频率；灵敏度；小型化

Design of MEMS Bionic Vector Hydrophone Based on NBR Encapsulation

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Abstract:

This paper introduces the material nitrile butadiene rubber (NBR), with good performance in sound transmission and anti-corrosion, in making the sound-transparent cap, and puts forward an optimal design of the encapsulation shell of the MEMS bionic vector hydrophone, resolving the problem that current encapsulation structure causes loss to sensitivity, making the hydrophone less sensitive to the bare chip. With the new encapsulation structure, the resonance frequency of the hydrophone has been dropped below 50 Hz, which ensures the frequency spectrum (50-4kHz) the hydrophone interested in free from the interference of the encapsulation resonance, broadening the working frequency band. The sensitivity of the optimal encapsulation has been improved to -170 dB (±2 dB), almost the same with the bare chip, and the maximum diameter of the hydrophone has been reduced from 36mm to 28mm, miniaturizing the hydrophone further.

Keywords: MEMS bionic hydrophone; encapsulation; frequency; sensitivity; miniaturization

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