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电容式微超声传感器的电极参数优化设计

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摘　要：

建立了电容式微超声传感器(cMUT)的有限元模型，通过对模型进行静电-结构耦合仿真分析，研究了金属电极的结构参数包括电极面积、电极厚度、电极材料以及电极相对与薄膜的位置等参数的变化对传感器性能的影响。分析了电极参数与传感器吸合电压，静态电容，机电转换比以及机电耦合系数的关系，最后得到了优化的电极结构参数，即金属电极面积为传感器振动薄膜面积的一半时，传感器具有较低的吸合电压和较大带宽值及机电耦合系数。

关键词：电容式微超声传感器(cMUT)，吸合电压，静态电容，机电耦合系数

Optimization design of the electrode parameters in capacitive micromachined ultrasonic transducer

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Abstract:

The metal electrode parameters affect the performance of a cMUT cell such as collapse voltage, static capacitance, bandwidth, transformation ratio and electromechanical coupling coefficient, the parameters including electrode size, electrode thickness, electrode material, and the position of the electrode relative to the membrane of a cMUT. This paper presents the analysis results of these effects by a 2D finite element model, and the optimal parameters of electrode within a cMUT are found, that is, the cMUT has a lower collapse voltage, a larger bandwidth and electromechanical coupling coefficient when the electrode size is half of the membrane size. The design and fabricate of cMUT could be more feasible according to the work of this paper.

Keywords: Capacitive micromachined ultrasonic transducer (cMUT), collapse voltage, static capacitance , electromechanical coupling coefficient

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