基于有限元模拟的泵用压电振子正交优化设计Orthogonal Optimum Design of the Actuator for the Piezoelectric Pump Based on Finite Element Simulation

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关键词： 压电泵 压电振子 正交设计法 优化设计 有限元法

摘 要： 作为压电泵的驱动源，压电振子的振动性能影响泵的性能。为此，对影响压电振子振动性能的压电振子结构参数以及材料参数进行优化设计。基于有限元模拟分析方法，采用正交试验和对分析结果进行极差分析，得到了各影响因素分别对压电振子中心点处振幅以及谐振频率两个重要指标影响的主次顺序，并得到了较好的方案。通过再设计试验分析，最终获得了提高压电振子振动性能的最优方案。As a driver of piezoelectric pump, the vibration performance of piezoelectric actuator influences the performance of piezoelectric pump. There are a number of factors which influence the vibration performance of piezoelectric actuator. Therefore, in order to improve the vibration performance of piezoelectric actuator, it is essential to optimize the structural parameters and materials. Based on the finite element simulation analysis method, an orthogonal scheme of four factors and three levels was designed. Through the range analysis for the result, the influencing order of each influencing factor on two important indexes that are the oscillation amplitude and resonance frequency of piezoelectric actuator were acquired. Simultaneously, the superior schemes were obtained. Because the superior schemes were not in the original design schemes, additional designs were made and contrasted. Finally, the optimal scheme was obtained.

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