

题 目： 压电阀的仿真设计

## 摘 要

随着微机电系统作为一种新兴技术越来越得到广大研究者的青睐，其分支之一微流动系统也得到迅速发展。压电阀以压电陶瓷材料制成的压电执行器作为核心结构，取代传统意义上的压电泵一般所需要的独立驱动与传动装置，可有效避免电磁干扰、效率损失与误差累积等问题。本文从压电阀的作用与分类开始，阐述了国内外研究现状，对与压电理论相关的逆压电效应、压电材料等知识进行简明介绍。围绕压电执行器的极化特性，设计了一种压电双晶片盘式压电阀结构，并利用 ANSYS 软件的强大功能对其进行建模、划分网格、静态分析等一系列仿真设计。

**关键词** 压电执行器 逆压电效应 极化 仿真

## ABSTRACT

As micro-electromechanical systems are increasingly favored by researchers as an emerging technology, one of its branches, micro-flow systems, has also developed rapidly. The piezoelectric valve uses the piezoelectric actuator made of piezoelectric ceramic material as the core structure, replacing the independent drive and transmission device generally required by the traditional piezoelectric pump, which can effectively avoid problems such as electromagnetic interference, efficiency loss and error accumulation. This article starts with the role and classification of piezoelectric pumps, expounds the current research status at home and abroad, briefly introduces the inverse piezoelectric effect and piezoelectric materials related to piezoelectric theory. Based on the polarization characteristics of piezoelectric actuators, a piezoelectric bimorph disc piezoelectric valve structure was designed, and a series of simulation designs such as modeling, meshing, static analysis, etc. were made using the powerful functions of ANSYS software.

**KEYWORDS** piezoelectric actuator inverse piezoelectric effect polarization simulation

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