# 介电弹性体材料机械能-电能转换特性 Characteristics of Electrical Energy Conversion for Dielectric Elastomer Film

鄂世举 朱喜林 曹建波 朱黎辉 惠安峰

浙江师范大学

关键词： 介电弹性体 发电 转换特性 仿真 实验

摘 要： 介电弹性体功能材料是具有优异性能的电场活化聚合物，可在驱动和发电两种模式下工作。依据介电弹性体薄膜材料的结构特征，分析了发电模式下介电弹性体材料发电的基本机理，即可变电容原理；建立了该材料的理论模型，得到麦克斯韦效应可作为压电效应处理的结果，并确定了对应压电效应的等效参数。通过仿真及实验分析了该材料的电能转换过程；分析了发电过程中电场与材料弹性回复力之间的关系，及其对发电效率的影响，确定了介电弹性体薄膜材料的发电周期过程。 As a new type of electroactive polymer (EAP), dielectric elastomers can work in both actuator and generator modes. Dielectric elastomers (DE) can achieve good performance in a generator mode, such as high energy density, good impedance matching to many energy sources, low cost, etc. Based on the structure of dielectric elastomers film, the fundamentals of dielectric elastomers, namely fundamentals of alterable capacitance are discussed. The theoretical models of dielectric elastomers film were analyzed, and the conclusion that Maxwell stress effects could be treated as a piezoelectric material with an effective piezoelectric coefficient was drawn. Power energy conversion cycle was analyzed by simulation and experiments, and the experimental curves of output voltages were investigated. The relation between electric field and elastic restoring stress, and its influence on power generating efficiency, were discussed. At last, the mechanical cycle of power generation for dielectric elastomers was determined approximately.

查看全文（请使用Adobe Acrobat 6.0版本浏览） 返回首页 引用本文