

A new configuration of generator made of dielectric elastomers

Tongqing Lu, Tiejun Wang*

State Key Lab for Strength and Vibration of Mechanical Structures,
International Center for Applied Mechanics, School of Aerospace Engineering,
Xi'an Jiaotong University, Xi'an 710049, China

Abstract

This paper shows a new tubular configuration of generator made of dielectric elastomers. A membrane of dielectric elastomer is rolled into a hollow tube and then connected to a mechanical load. The internal pressure of the tube is controlled by a connected air chamber. The tube is firstly prestretched biaxially by the internal pressure and the mechanical load, with its capacitance increasing substantially. Then a low voltage is applied on the prestretched tube. As the tube is cut off from the battery, the total charge on the tube is fixed. Relaxing the mechanical load and the internal pressure, the sharply decreasing capacitance will boost up the voltage. We theoretically calculate the energy conversion during the cycle and demonstrate that the new configuration has much higher energy density than the existing tubular generator used by SRI.

* Corresponding author: wangtj@mail.xjtu.edu.cn