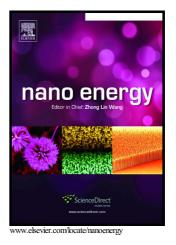
### Author's Accepted Manuscript

Freestanding-electret rotary generator at an average conversion efficiency of 56%: theoretical and experimental studies

Mingzhao Bi, Shiwen Wang, Xiaofeng Wang, Xiongying Ye



 PII:
 S2211-2855(17)30603-1

 DOI:
 https://doi.org/10.1016/j.nanoen.2017.09.057

 Reference:
 NANOEN2233

To appear in: Nano Energy

Received date:16 August 2017Revised date:14 September 2017Accepted date:27 September 2017

Cite this article as: Mingzhao Bi, Shiwen Wang, Xiaofeng Wang and Xiongying Ye, Freestanding-electret rotary generator at an average conversion efficiency of 56%: theoretical and experimental studies, *Nano Energy*, https://doi.org/10.1016/j.nanoen.2017.09.057

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

#### Freestanding-electret rotary generator at an average conversion

#### efficiency of 56%: theoretical and experimental studies

Mingzhao Bi, Shiwen Wang, Xiaofeng Wang, Xiongying Ye\*

State Key Laboratory of Precision Measurement Technology and Instruments, Dept. of Precision Instrument, Tsinghua University, Beijing 100084, China

## Abstract

Harvesting ambient mechanical energy is a crucial method to gain low-cost, clean and sustainable electric energy for self-powered electronics. Herein, we develop a freestanding-electret rotary generator and the explicit analytical solutions of the output current, voltage and average power are obtained from its theoretical model. The maximum average output power and the matched load resistance can be estimated directly from simple formulas. The generator using an inexpensive micro-nano-structured PTFE electret film achieves an open-circuit voltage with an amplitude of 650 V and a conversion efficiency about 56% with 10.5 mW output power at a rotation rate of 750 rpm. We find that the opposite charges injected into the back of the electret during the charging process tremendously counteract the effect of the charges on the front and reduce the output power. Eventually the theoretical and experimental results are very close when the net charge density is used instead of the surface charge density.

**Keywords:** energy harvesting, electret, electrostatic induction, rotary generator, freestanding.

Download English Version:

# https://daneshyari.com/en/article/5451786

Download Persian Version:

https://daneshyari.com/article/5451786

Daneshyari.com