Micro-Meso Scale Triboelectric Energy Harvesting

Joseph Garcia, Pavitpal Bhatia, and Theron Smith, ME
Advisor: Farzad Ahmadkhanlou, Ph.D.

UCI Samueli School of Engineering
University of California, Irvine

Abstract

Trioboelectric energy is being researched to be used as a potential source of alternative energy. Triboelectric energy is generated by the electron exchange process when the two materials of different polarities are rubbed together. We hope to harness and store the voltage resulting from the electron exchange by attaching electrodes to both materials.

Goal & Application

1) Develop a thorough understanding of how trioboelecrity works.

2) Identify a practical application and develop a working model that demonstrates how triboelectric energy can be effectively harnessed.

This technology is proposed to be incorporated into floor tiles that are used in public areas such as subways. As the tiles are stepped on, they experience vertical displacement that allow the separate triboelectric materials to come into contact with each other. This application is advantageous because of two elements:

- People will generate energy by not doing more additional work than they normally do. Hence, energy that is already produced is being harnessed.
- The constant foot traffic of people in areas like subways will allow for large power production.

Current Status

Determining what parameters influence the ability to generate electricity by testing contact frequency, wave input, and materials combinations such as Kapton and BOPP, Kapton and PMMA, Kapton and Silicon, and Kapton and Teflon.

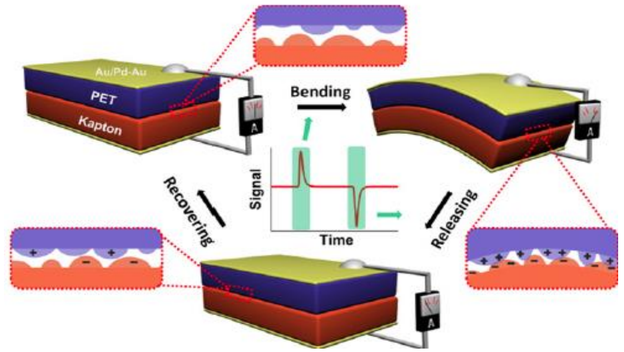

Fig. 1: Flexible triboelectric generator" Feng-Ru Fan, Zhong-Qun Tian, Zhong Lin Wang, Nano Energy, 2012, 1 (2), 328-334

CAD Model Application

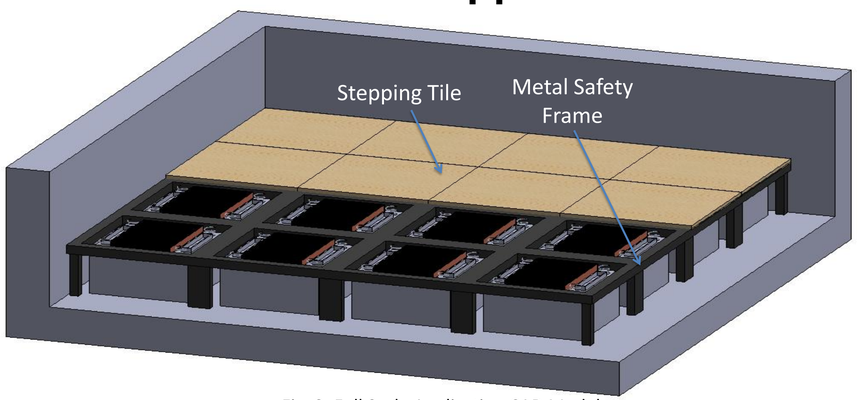

Fig. 2: Full Scale Application CAD Model

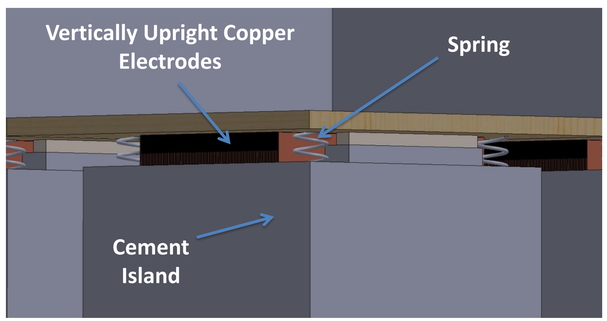

Fig. 3: Close Up View of CAD Model

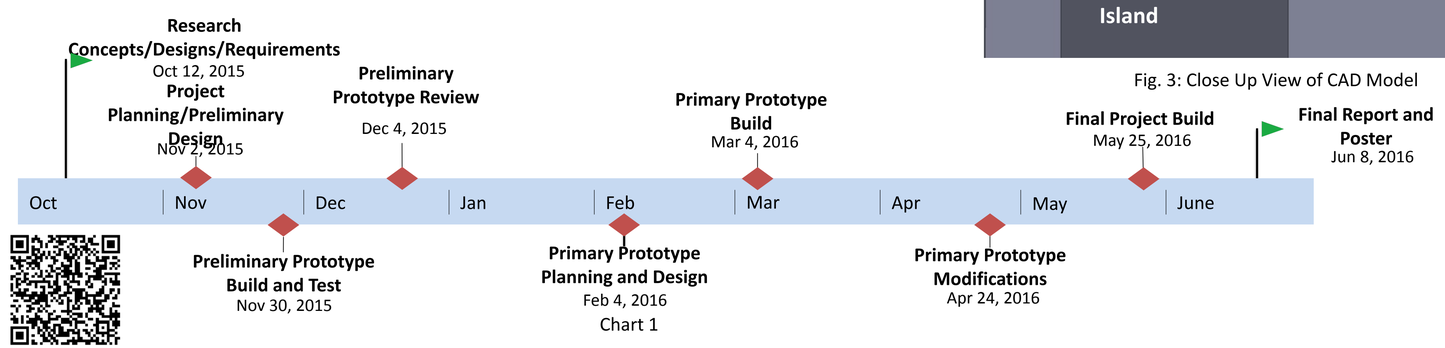

Chart 1

Testing Model

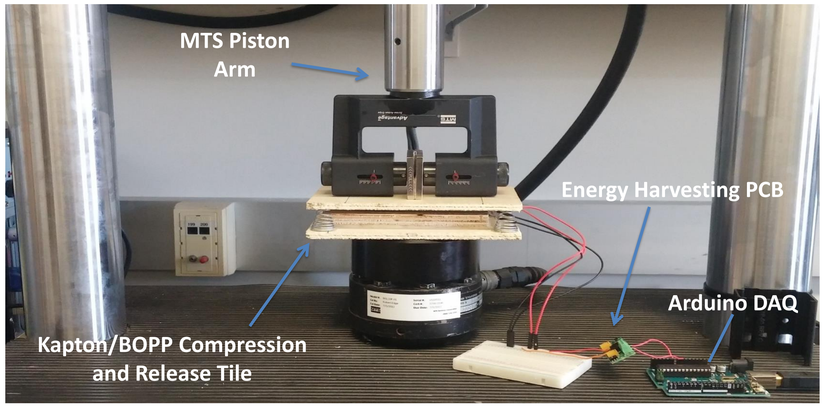

Fig. 4: Prototype tile in MTS test setup

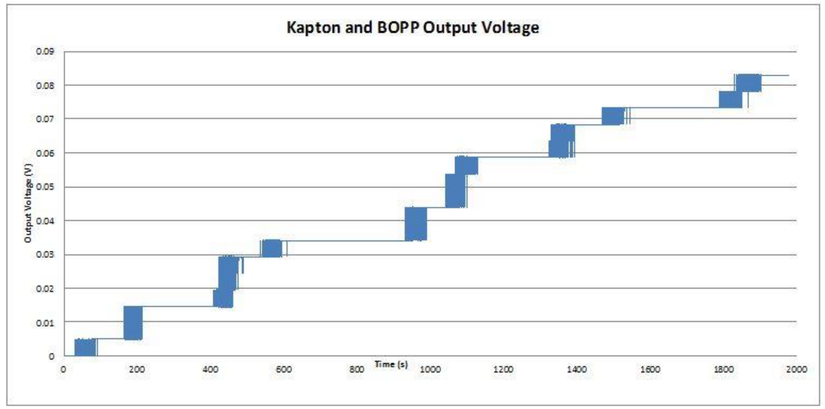

Chart 2: Kapton and BOPP MTS Testing Results

R&D Cost $327

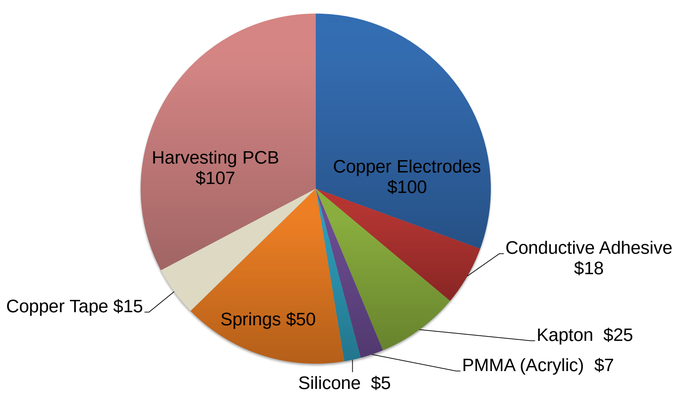

Chart 3