

The Effect of Air Gap on the Performance of Sliding-Triboelectric Nanogenerators

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Triboelectric Nanogenerator (TENG) is an energy harvesting device via converting the mechanical energy to electrical energy based on the contact electrification and electrostatic induction. There are two principle modes of triboelectric nanogenerators: the contact-mode and the sliding-mode. The sliding-mode is more effective for static charge generation compared to the contact-mode. In this paper, we will study the effect of air gap on the Attached-electrode sliding-mode TENG. The gap has a great influence on the TENG output parameters which are the open circuit voltage, the short circuit charge, the capacitance, and the output energy. A comparison between the optimal simulation results between the different types of attached electrode TENG modes is introduced. A new equation of the open circuit voltage and capacitance of the attached electrode sliding mode is proposed taking into consideration the gap effect. The gap between the two electrodes has been studied physically using the COMSOL Multiphysics and analytically using the MATLAB. The increase in the gap leads to the increase in the open circuit voltage and decrease in the short circuit charge. It is found that the attached electrode TENG dielectric to dielectric with the gap of 10% of width of the TENG is the best one in generating all TENG outputs.

Biography:

Dr. Ashraf Seelym earned his B.Sc. degree in Air Defense Science (Radars & Missile Systems) from Air Defense College, Armed Forces of Egypt in 1993. He earned his second B.Sc. degree in Electrical Communications Engineering and Electro-Physics (Excellent with Honors) from the Faculty of Engineering, Alexandria University, Egypt in 1994. In 2003, He received his M.Sc. degree in Electronics and Communication Engineering. In 2012, he earned his Ph.D. degree from Cairo University.

In 1995, he joined the Department of Engineering Science at the Air Defense College, Egypt as a full-time Demonstrator and then Assistant Lecturer. In 2012, he was appointed as Assistant Professor at the Department of Electrical Engineering, Faculty of Engineering, October 6 University, Egypt. Dr. Ashraf is currently an Assistant Professor at the Department of Electrical and Communications Engineering, Faculty of Engineering, BUE since 2015. His research interests span the areas of Radar Signal processing, Noncoherent LADAR, and SAR Waveform Diversity. Dr. Ashraf is also interested in Energy harvesting and photovoltaic applications. Now, He is the PI of a joint research project between US (MIT) and Egypt (The British University in Egypt).