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To Understand the Behavior of Triboelectric Effect and Apply For the Production of AC Supply by Mutual Induction

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Abstract: **This paper investigates the effect of turboelectric materials and the use of mutual induction in static charges to generate a potential difference in a shaft in a magnetic field to generate an a.c supply in an small scale dynamo and the generated electric supply for an small device with low power rating.**

Keyword: **Triboelectric, potential difference, friction charging, polarity induction waveforms, TENG.**

I. INTRODUCTION

Triboelectric effect is one of the useful processes that can not be harnessed directly for the application of useful purposes but before that we have to understand this. Triboelectric effect is a phenomenon when a few substances gets electrically charged due to the effect of friction . Now, as a few substances like acrylite and Lucite gets positivily charged while materials like ebonite and Teflon gets negatively charged. Now these papers will illustrate how to possibly use these charges in a way to generate an a.c supply through mutual induction using a set of small shaft in a dynamo. Now through a series of experimental tests, we actually used triboelectric materials like ebonite and acrylic and used them on two different sets of surfaces. And we using prime movers generated friction and we saw an induction of charges in flux behavior but their polarity was opposite in nature.

Besides these pure materials, the contact materials can be made of composites, such embedding nanoparticles in polymer matrix. This not only changes the surface electrification, but also the permittivity of the materials so that they can be effective for electrostatic induction. Therefore, there are numerous ways for enhancing the performance of the TENG from the materials point of view. This gives an excellent opportunity for chemists and materials scientists to do extensive study both in the basic science and in practical application. In contrast, materials systems for solar cell and thermal electric, for example, are rather limited, and there are not very many choices for high performance devices.

The figure below represents the shaft mechanism on a small scale to demonstrate the electricity generation once the triboelectric materials gets (acquires) charge due to the prime movers to generate friction and this friction generates an inverse charge on the poles due electro mutual induction. This mutual induction actually helps the poles to generate an electric potential in order to move the shafts in a clockwise direction. Now this movement of the shaft helps generate an emf good enough to to generate a very small potential difference and thus can be harnessed or can be used directly in any given digital medium which works on ac supply.

Fig. (1) shows a small shaft having wound magnetic field to generate emf

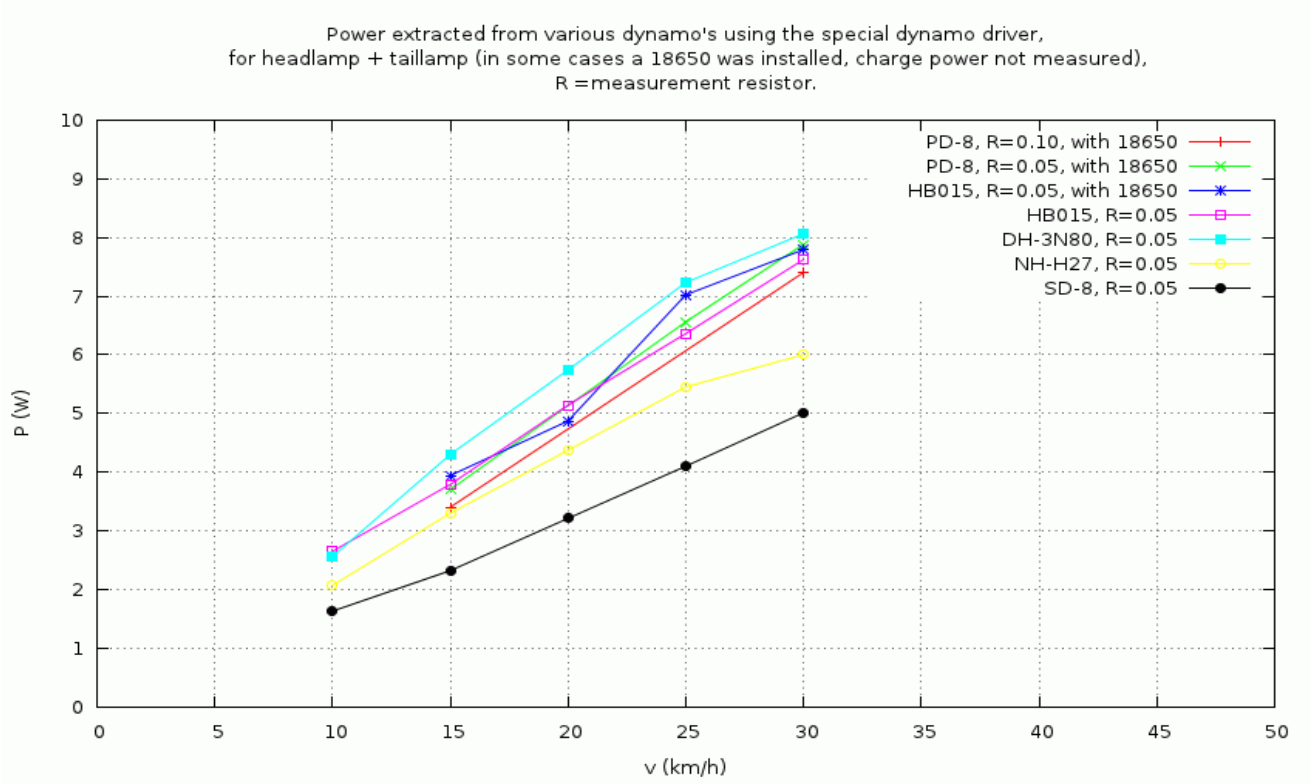

Fig. (2)

Although the word comes from the Greek for "rubbing", τρίβω (τριβή: friction), the two materials only need to come into contact and then separate for electrons to be exchanged. After coming into contact, a chemical bond is formed between parts of the two surfaces, called adhesion, and charges move from one material to the other to equalize their electrochemical potential. This is what creates the net charge imbalance between the objects. When separated, someof the bonded atoms have a tendency to keep extra electrons, and some a tendency to give them away, though the imbalance will be partially destroyed by tunnelling or electrical breakdown (usually corona discharge). In addition, some materials may exchange ions of differing mobility, or exchange charged fragments of larger molecules. The triboelectric effect is related to friction only because they both involve adhesion. However, the effect is greatly enhanced by rubbing the materials together, as they touch and separate many times. For surfaces with differing geometry, rubbing may also lead to heating of protrusions, causing pyroelectric charge separation which may add to the existing contact electrification, or which may

oppose the existing polarity. Surface nano-effects are not wellunderstood, and the atomic force microscope has enabled rapid progress in this field of physics.

II. UNDERSTANDING THE GENERATION OF A.C OUTPUT THROUGH MUTUAL INDUCTION

Now as we observed this effect, though it can not be harnessed or used otherwise, so what we did was used mutual induction in order to use it in an applicable way. Mutual induction is a way by which we can generate opposite charges on two bodies. And by this process we can have a constant mutual induction if the prime movers can keep generating static charges in the basic two bodies. Now here we need a set of mechanisms in order to efficiently use the derivatives and the application of transfer of energy in either static or dynamic supply. Now through this mutual induction we are actually creating a p.d at two extreme poles of a small shaft. Now after a considerable amount of time(say a few seconds) the p.d increases rapidly and with it the shaft also begins to move and causes EMI (Electromagnetic induction) and thus causes a dynamic current to develop with a very low potential system. Now, in a way we can use this mechanism in order to develop it into a resourceful way to use in our daily basis. Unlike other mechanisms of power generation it will be renewable with a very least comlexicity to work efficiently.

Now the output a.c supply can be stabilised and thus can be used directly while generation will actually take place. Now In order to understand the behavior of triboelectricity we need to get into the physical chemistry of triboelectric materials, as these materials have an energy diagram with charge density of positive and negative charges in an unstable region, and as we provide an little energy to these materials through an friction through an external source, the charge carriers with more affinity to gain energy tends to get excited and triboelectric material tends to gain an majority charge on its excited level resulting in acquiring a charged nature. Now depending upon the type of nature of the material, it either possesses a positive charge or a negative charge, even a few materials acquire neutral.**A triboelectric nanogenerator is an energy harvesting device that converts the external the ambient mechanical energy into electricity by a conjunction of triboelectric effect and electrostatic induction.**

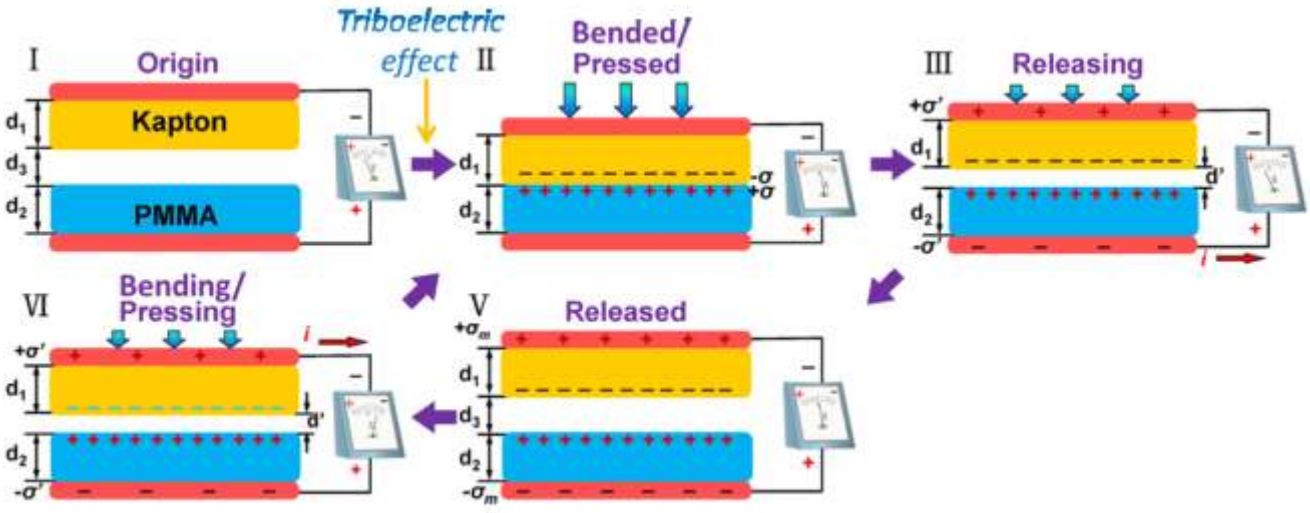

Fig. (3) Contact separation node of triboelectric generator in basic functionallity

The surfaces of the materials can be functionalized chemically using various molecules, nanotubes, nanowires or nanoparticles, in order to enhance the triboelectrification effect. Surface functionalization can largely change the surface potential. The introduction of nanostructures on the surfaces can change the local contact characteristics, which may improve the triboelectrification. This will involve a large amount of studies for testing a range of materials and a range of available nanostructure. Therefore, there are numerous ways for enhancing the performance of the TENG from the materials point of view. This gives an excellent opportunity for chemists and materials scientists to do extensive study both in the basic science and in practical application. In contrast, materials systems for solar cell and thermal electric, for example, are rather limited, and there are not very many choices for high performance devices.

III. CONCLUSION

This research paper indicates towards a very realistic though unconventional way of how this new technology can be used for triboelectric generation. There are various technologies like TENG and shaft induction due to polarity inversion on which this research paper basically throws lights on Triboelectric materials can be really used for small scale power generation with low intensity (small p.d) but it could be resourceful in near future.

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