The green system of power generation

Introduction

Recently, the interest in environmental problems has risen and it is accompanied by up coming development of the green systems of power generation. In such times, “the floor which generates the electricity” which Hayami developed is high lighted by media. I researched it in order to understand it in detail. Then, I noticed that piezoelectric elements are used in this system. In this paper, I will describe the experiments I have conducted to test the effectiveness of a piezoelectric element. As a result, I could not create big electric power from a piezoelectric element. However, there were the conditions to create bigger electric power and it could light up LED lights. So it is possible to apply to lightings. I will try to prove that piezoelectric elements will become the green power generation in this paper.

Background

The global warming

I am interested in environmental problems, especially the global warming. Though there are some causes of the global warming, it is said that the major cause of the global warming is carbon dioxide. There are more carbon dioxide emissions where ever people are because, of course, people breathe. Another reason, they manufacture

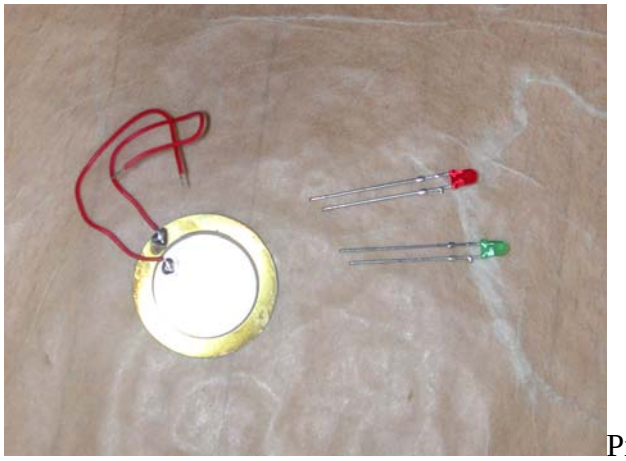
things and they transport things. I think that it is using the electricity that is the closest cause in our life. Why dose the electricity have a relation to carbon dioxide emissions? When you burn something, there are carbon dioxide emissions. In Japan and most other countries, approximately half of the electricity is supplied by thermal power generations which generate the electricity by burning coal, petroleum and so on. So the more electricity you use, the more carbon dioxide emissions there are. Using the electricity has a close relation to the global warming. So I try not to waste the electricity in my daily life. However, it is impossible not to use the electricity at all because many convenient home appliances have appeared and they are indispensable for people of today. From this fact, researchers have tried to reduce carbon dioxide emissions when it is generated. That was why there has been a great research in the green systems of power generations and development of them. Photovoltaic power generation or wind power generation is one of them. Thus I thought that I would try to research in a green system of power generation and to make it.

Piezoelectric element

I paid attention to “the floor which generates the electricity” which was developed by Hayami who is a representative director of Sound Power Corporation some years ago. According to his study, “Sound power and vibration power are everywhere we live at present society. These energies have not been used for anything and they have been

wasted. The technology of generation which my corporation has developed originally is able to use sound power and vibration power for generation effectively. We suggest an ecological life style which has never appeared until now by developing various system of generation which these technologies are applied to.” (Sound Power Corporation HP, 2008, translated by me) His corporation gave this technology to Syuto highway and Tokyo station and they are trying put to practical use. It is the theory that it generates by vibration when people walk or when cars move. I think it is a nice idea that energy which has wasted still now is utilized.

I was continuing to research this system and I noticed it is piezoelectric elements that are used in “the floor which generates the electricity”. Usually we use a piezoelectric element for vibration by turning on electricity. To the contrary, being applied vibration, strictly speaking pressure, it generates the electricity. I thought that it had a possibility of a green power generation. I would like to research piezoelectric element in detail. So I have conducted some experiments. And I will consider possibility or future of piezoelectric element.

 Piezoelectric element

Experiments

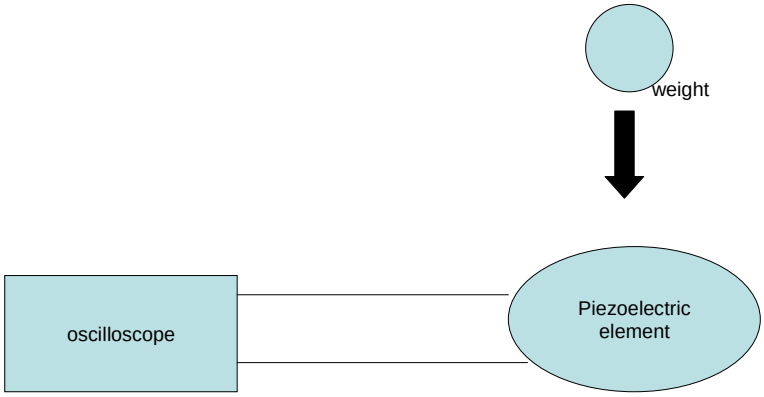
In this section, I will illustrate the experiments which I have conducted.

Experiment I

The purpose of this experiment is that I understand the character of a piezoelectric element.

Method

First, I set the circuit like figure. Then I dropped a scale weight on the electric element and I measured the voltage at that time by an oscilloscope. Then I calculated the electric current and the electric power.



Results

The chart shows the result of this experiment.

A super ball (13.8g)

	voltage (V)	electric current (A)	electric power (W)
height 1cm	20	0.0015	0.03
height 5cm	40	0.0025	0.1
height 10cm	60	0.004	0.24

A super ball (5.0g)

	voltage (V)	electric current (A)	electric power (W)
height 1cm	15	0.001	0.015
height 5cm	20	0.0015	0.03
height 10cm	40	0.003	0.12

An anelasticity ball (16.6g)

	voltage (V)	electric current (A)	electric power (W)
height 1cm	40	0.005	0.2
height 5cm	40	0.01	0.4
height 10cm	50	0.015	0.75

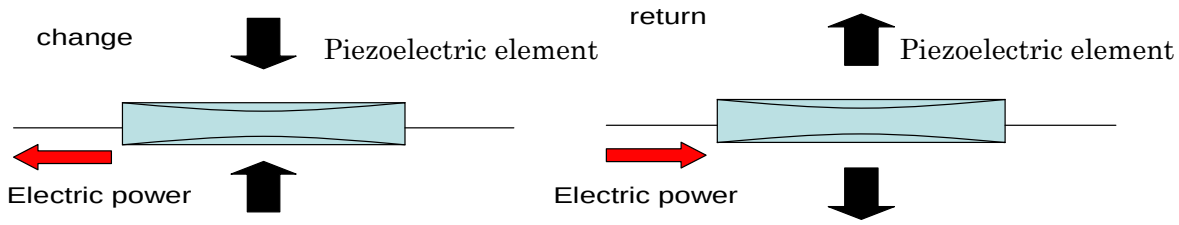
A ping pong ball (2.3g)

	voltage (V)	electric current (A)	electric power (W)
height 1cm	20	0.0015	0.03
height 5cm	30	0.003	0.09
height 10cm	40	0.005	0.2

Moreover, an electric current when I push a piezoelectric element send an opposite direction of an electric current when I hand off.

Analysis

The electric power depends on the height of a scale weight. The higher a scale weight is dropped, the bigger electric power you generate. The electric power depends on weight of a scale weight. The heavier a scale weight is dropped, the bigger electric power you generate. The electric power depends on tough a scale weight. The harder a scale weight is dropped, the bigger electric power you generate. When a piezoelectric element changes its shape, electric power is generated. Then, when a piezoelectric element returns, electric power is generated. (below figure)

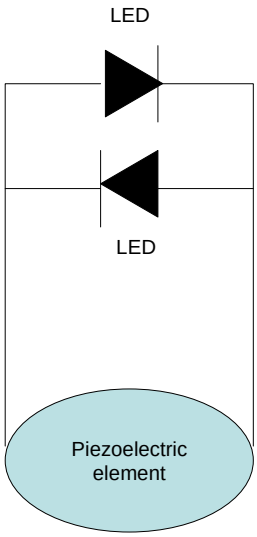


Experiment Ⅱ

The purpose of this experiment is that I consider what piezoelectric element applying to.

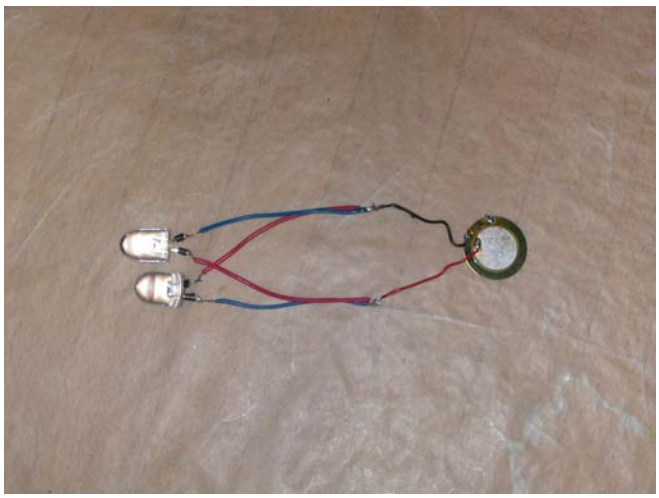
Method

I connected a piezoelectric element with tow LED lights like figure. Then I tapped on piezoelectric element.



Results

Being tapped, a piezoelectric element lighted up tow LED lights.



Analysis

A piezoelectric element can light up LED lights when it is tapped. Because an electric current when I push a piezoelectric element send an opposite direction of an electric current when I hand off, I made two LED lights light up stably. I apply piezoelectric element to light up lightings like illumination.

Definition of the green power generation

I have defined what the green system of power generation is. Because it is necessary that definitions of the green power generation are discussed before I consider whether piezoelectric element is the green power generation. I have thought three definitions. First, there are not carbon dioxide emissions. We must not make carbon dioxide emissions which cause the global warming because I think how we will stop the global warming. So it is an indispensable condition. Second, there is no danger to people and nature. Without carbon dioxide emissions, we must not destroy other environments. We must aim to coexist with nature. Third, the system of power generation is used wasting energy. There are a lot of wasting energies in a present time. What is more, some are environmental pollutions. Unless we can make no wasting energy, we utilize the energy. We can generate the electricity and we can keep away pollution. It is killing two birds with one stone.

I have thought whether the system utilized piezoelectric element is the green power generation with these definitions. There are not carbon dioxide emissions at the phase in generation. Piezoelectric element itself is not danger to people and nature. In addition, vibration energy is wasting. Sometimes, it has become an environmental pollution. We can utilize this energy. When vibration energy is changed into electric energy, vibration energy is absorbed because of the law of the conservation of energy. So this system is also expected as vibration pollution-control measures. That is why it is exactly the green power generation.

Evolution of piezoelectric element

I will consider that evolution of piezoelectric element. I could get only little electric power from piezoelectric element but I think that I can get big electric power if I come up with various ideas. I have three ideas. It can light up LED lights at the moment when it is tipped. However, I would like to get stable electric power. So I have to store electric power by condenser or something which can store the electricity. Besides, I should improve high-powered piezoelectric element. Though I used piezoelectric element on the market, it is good for this system that piezoelectric element is improved. For example, the element can create bigger electric power and the element can catch wide range vibration. Another idea is that a high-performance system is developed. A system is set with some piezoelectric elements at the right place. One piezoelectric

element generates little electricity but some piezoelectric elements can generate big electricity if they gather. If we will be able to do so, we expect to get big electric power and piezoelectric element can be applied in many ways. For example, the electricity in the station is supplied by step of people, streetlights are turned on by vibration of train and it is also possible that the home appliances which vibrate and they run on the electricity which generate for themselves. It is a promising system. If the green power generations like this should work well in a present society, we do not have to depend on thermal power generation. In consequence, the world does not toward to the global warming.

Conclusion

Piezoelectricity element is capable of becoming a green power generation. At present, we cannot expect to get big electric power from piezoelectric element. However, electric power from piezoelectric element depends on some conditions and it is able to put the little electric power to practical use. For example, it can light up LED light. It is possible that the electricity from piezoelectric element is stored and that it lights up illumination. The system with some piezoelectric elements will be developed. As a result, we can apply wherever vibration energy is wasting. Then we can provide some electric power. If each green power generation should supply small electric power, we will not need to be dependent on thermal power generation. In addition, if still more

technical innovation will happen, we can get big electric power and piezoelectric element may be possible to cover the electric power of Japan no, possibly world.

List of Reference

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