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## Piezoelectric Mat as Door Bell

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### ABSTRACTS

Ecological Crisis is a change in world weather which is getting warmer due to the accumulation of CO<sub>2</sub> gas in the atmosphere. Burning rock coal which is a source of electricity generation, is a contributor to the effects of the ecological crisis in the world. This caused the world needs new energy sources, such as piezoelectric, etc. The manufacture of piezoelectric mats as house bells aims to show that there is alternative energy for power generation in order to reduce the use of coal in Indonesia. By reducing the use of coal, it will reduce the occurrence of an ecological crisis. The research method we used was an experiment with planning, design and implementation stages. The renewal of this project is to assemble and apply the piezoelectric directly to objects that require electrical energy by replacing the power source from the piezoelectric system, and implementing it for house bells. Piezoelectric mat is a mat that can generate electrical energy if the surface is pressed. This energy can be generated from the piezoelectric that is installed on the inside of the mat. Piezo mats will be installed to be stepped on by guests visiting a house. This foot step will put pressure on the mat. The more tread is obtained, the more electricity is generated. This piezo carpet will be installed in front of the house. The use of piezo mats is an effort to utilize mechanical energy in the form of pressure generated by footrests into electrical energy.

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## 1. INTRODUCTION

Ecological crisis is a change in world weather which is getting warmer due to the accumulation of CO<sub>2</sub> gas in the atmosphere. Ecological is caused by burning fossil fuels, such as coal, petroleum, and natural gas, which release carbon dioxide and other gases known as greenhouse gases to the atmosphere. Burning rock coal which is a source of electricity generation, is a contributor to the effects of the ecological crisis in the world (Bamberry, 2010). This caused the world needs new energy sources, such as piezoelectric, etc.

The piezoelectric effect is where a mechanical stress applied to a material with a specific crystalline structure develops an electrical charge. Piezoelectric energy can be harvested to convert walking motion from the human body into electrical power (Howells, 2009). Piezoelectric energy harvesting has attracted wide attention from researchers especially in the last decade due to its advantages such as high power density, architectural simplicity, and scalability (Esmaeeli et al., 2019; Gonzalez-Lagunas, 2017; Fu et al., 2018; Chen et al., 2019; Bae et al., 2021). This results many experiments, including piezoelectric on roads, speed bumps, etc (Walubita et al., 2018; Chen et al., 2017). However, there is no study about piezoelectric on a mat.

The manufacture of piezoelectric mats as house bells aims to show that there is alternative energy for power generation in order to reduce the use of coal in Indonesia. By reducing the use of coal, it will reduce the occurrence of an ecological crisis.

## 2. METHODS

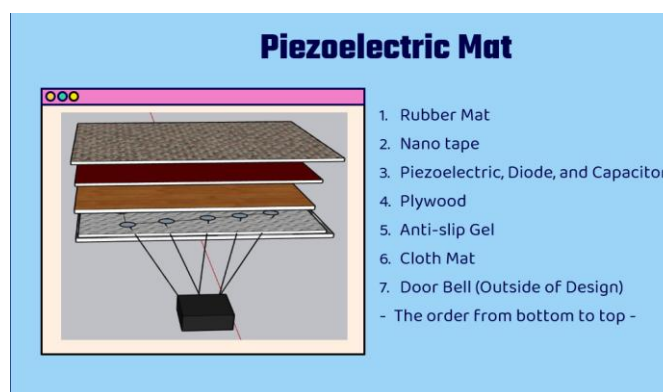
We use many resources and several equipment in this project as shown in Figure 1. These were the experimental method used in this study.

1. Put the piezoelectric components on the rubber mat, using nano tape
2. Combine the capacitor with diode (rectifier) using a solder
3. Assemble a a cable circuit to piezoelectric and capacitor using a parallel spans
4. Combine with the cable and the switch, leading to the bell
5. Put the plywood above the circuit
6. Put the anti-slip gel on the plywood
7. Cover the plywood and electric components, using the cloth mat

## 3. RESULTS AND DISCUSSION

**Figure 1** presented the 3D design of piezoelectric mat. The design is created using Google Sketchup, which provides the tools to design something in 3D.

The results of the experiment is that at an interval of 6 hours, this piezoelectric mat produces a different sound of bell, as listed in **Table 1**. **Table 1** shows the relationship between the duration of applying pressure and the amount of bell sound produced. Within 6 hours the mat is kept in front of the door, the mat produces a sound that is not too loud, but after being placed for 12 hours, the mat produces a big sound. So based on this experiment the longer the piezoelectric mat is pressed, the greater the sound produced.



**Figure 1.** 3D design of piezoelectric mat.

**Table 1.** Experimental Result

Duration of Applying Pressure	The Magnitude of The Sound
0 hours	No Sound
6 hours	Small Sound
12 hours	Loud Sound

When the piezoelectric mat is pressed, a piezoelectric effect will occur and an AC current is supplied to the diode. Then from the diode the charge is flowed to the capacitor to store charge. The more people who use the mat, there will be a lot of pressure received by the piezoelectric. So that a lot of charge is flowed and stored in the capacitor. Then when we want to use the bell, the charge that has been collected by the capacitor will be channeled to the electric bell as needed. Because the resulting voltage is small, the piezoelectric mats are arranged in parallel.

#### 4. CONCLUSION

After 6 and 12 hours of experiment, the piezoelectric mat produced the sound of a door bell. This shows the existence of alternative energy for electricity generation.

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#### 5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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