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Research Article

USE OF PESOELECTRIC EFFECTS IN IN MEASUREMENT TECHNOLOGY

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ABSTRACT

This article discusses the process of the piezoelectric effect observed in semiconductor materials, and the possibility of using piezoelectric elements that produce this effect in measuring technology. The prospects for the use of piezoelectric elements in various measurement techniques are considered.

KEYWORDS

Piezoelectric effect, piezoelectric element, semiconductor material, deformation of solids, electric current, measuring instruments.

INTRODUCTION

Today, in many areas, the use of measuring instruments remains one of the daily requirements. The fulfillment of the task set correctly and in accordance with the established standard largely depends on the measurement work carried out in them [1-4]. Therefore, in the development of measuring instruments used in various fields, in order to increase the efficiency

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and accuracy of measurements, physical effects that occur in various semiconductor, conductor, and dielectric materials are widely used. Piezoelectric effects in dielectric materials are also widely used in the development of measuring instruments. This effect is used as the main one not only in the development of measuring instruments, but also in many devices in which it is necessary to convert mechanical energy into electric field energy [5-7].

THE MAIN PART

The piezoelectric effect in dielectric materials is a phenomenon where polarization occurs when dielectric materials are subjected to mechanical pressure. Piezoelectric effects of this type are properly called piezoelectric effects. When an external electric field acts on dielectric materials, deformation occurs in such materials, this effect is called the inverse piezoelectric effect. Dielectric materials with a piezoelectric effect are called piezoelectric elements. Typically, such piezoelectric elements have both direct and reverse piezoelectric effects. Literary Analysis . Many scientific studies have been carried out on the use of piezoelectric elements in the development of measuring and control devices in various fields. In particular, the Malaysian scientist Arshed Abdulhamed Mohammed in the article "The role of piezoelectric elements in determining the mechanical properties of solid industrial materials" considered the possibility of using piezoelectric materials in determining the deformation of solid materials and measuring the degree of deformation [1,6,7]. In addition, the scientist of the Silesian University of Technology, Marek Plakzer, in his article "The use of piezoelectric transducers of the MFC type in mechatronic measuring systems - the impact of damage to the mechanical subsystem on the operation of the system" highlighted the possibilities of their use as measuring instruments in mechatronics [2,5,8]. Sometimes it will be necessary to measure vibroacoustic signals of extremely low frequency from 0 Hz. Of course, there are rather expensive specialized sensors for this purpose, but cheap piezo emitters can also be adapted. They are used to generate sound (tweeters) in various mobile devices. The fact is that piezoelectrics work in different directions [9,10]. Structurally, the piezoelectric element is a piezoceramic with applied electrodes. Piezoelectric elements can be of various shapes: in the form of disks, rings, tubes, plates, spheres, etc. To receive a digital signal, you can use the Arduino board and connect the piezo element to its analog input (Fig. 1). But here a problem arises - during the operation of such a sensor, the signal gradually increases and goes into saturation. This situation can be simulated by using a high-resistance potentiometer and a high-value capacitor instead of a piezoelectric sensor (a piezoceramic with two metal plates is a capacitor).

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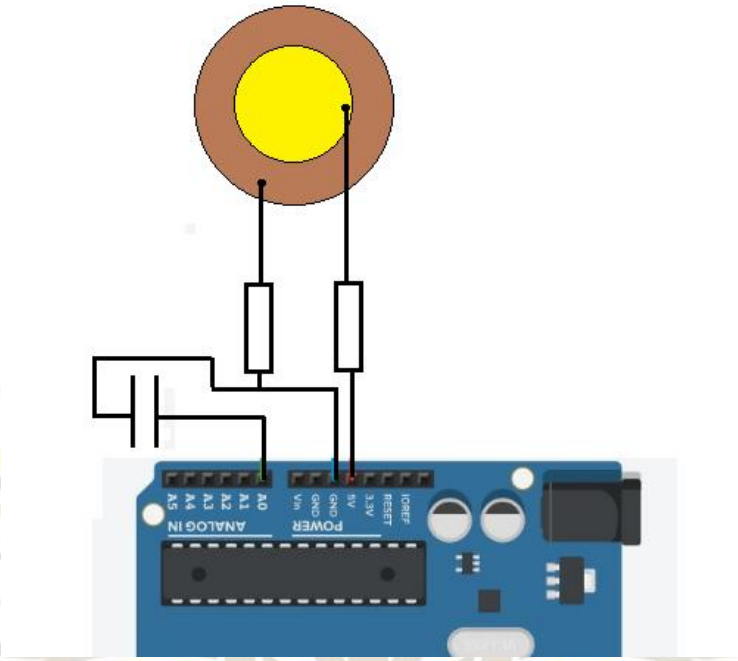

Fig.1. Connection diagram of the piezoelectric element

It is because of him that problems arise, because. it is charged with charges from the piezoelectric element and cannot be discharged, because. ADC resistance is quite high.

For testing, the following code for Arduino is suitable :

```
void setup() {pinMode ( A0, INPUT); Serial.begin ( 9600);}

void loop() {Serial.println ( analogRead (A0));delay( 10);}
```

CONCLUSIONS

With this device, you can get objective data on fairly strong vibrations, for example geological. From biomedical signals, it is possible to detect only the pulsations of the arteries in order to calculate the heart rate. For greater sensitivity, a DC amplifier with high input impedance and a low-pass filter should be placed between the ADC and the sensor.

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