



# CONSTRUCTING A THERMOCOUPLE THERMOMETER TO INVESTIGATE TEMPERATURE OF BUNSEN BURNER

A Project work

Submitted to National Institute of Science and  
Technology (NIST), Banepa

In Partial Fulfillment for the Requirement of  
Academic year in Science



By:

Sushil Giri

Symbol Number: .....

Date: 2079/.....

## RECOMMENDATION

This is to recommend that SUSHIL GIRI, Symbol No:....., has carried out project work entitled “Constructing a thermocouple thermometer to investigate temperature of bunsen burner” for the requirement to the project work in secondary level in Physics under my/our supervision in the Department of Physics, Banepa NIST, Banepa, Kavre. To my/our knowledge, this work has not been submitted for any other certificate. He has fulfilled all the requirements laid down by the Curriculum Development committee, Nepal for the submission of the project work for the partial fulfillment of Secondary School.

.....

Supervisor Banepa NIST

Banepa, Kavre

Date:.....

## DECLARATION

This project work entitled “Constructing a thermocouple thermometer to investigate temperature of bunsen burner” is being submitted to the Department of Physics, Banepa NIST for the partial fulfillment of the requirement to the project work in school in Physics. This project work is carried out by me under the supervision of ..... and co-supervision of Shyam Sundar Dahal in the Department of Physics, Banepa NIST, Banepa, Kavre, Nepal. This work is original and has not been submitted earlier in part or full in this or any other form to any institute, here or elsewhere, for the award of any certificate. .... Signature Name of student: Sushil Giri Symbol No. .... Registration No.....

Date:.....

## LETTER OF FORWARD

On the recommendation  
of ..... and Shyam sundar  
Dahal, this project work is submitted by Sushil Giri, Symbol  
No....., entitled “Constructing a thermocouple  
thermometer to investigate temperature of bunsen burner” is  
forwarded by the Department of Physics Banepa NIST  
College, for the approval to the Evaluation Committee, CDC,  
Nepal. He has fulfilled all the requirements laid down by the  
CDC, Nepal for the project work.

.....  
Shyam Sundar Dahal  
Head of Department  
Department of Physics ,Banepa NIST

## CERTIFICATE OF APPROVAL

This is to certify that the Project work submitted by Sushil Giri entitled “CONSTRUCTING A THERMOCOUPLE THERMOMETER TO INVESTIGATE TEMPERATURE OF BUNSEN BURNER” is good in the scope, a novel concept and has quality as Project work in the partial fulfillment for the requirement of academic year in Science.

### Approval Committee

.....

Internal Examiner

.....

External Examiner

Head of Physics Department

Shyam Sundar Dahal

.....

Internal Examiner

Supervisor



Date:.....

## ACKNOWLEDGEMENTS

I would like to express my acknowledgement to my supervisor ..... whose guidance and dedication to excellence helped me to carry out this project work. I am very much thankful for all the new ideas and suggestion that he made in order to make right decision on the way of completing the project work.

I would like to acknowledge all the members of Department of Physics for their directives to make this project work reach its final deliberation.

I am much thankful to my entire friend for the help in completion of this project.

This work would not have been possible without untiring encouragement and support from my family, for which I am always grateful.

## ABSTRACT

Thermocouples are known for their versatility as temperature sensors therefore commonly used on a wide range of applications - from an industrial usage thermocouple to a regular thermocouple found on utilities and regular appliances. Due to their wide range of models and technical specifications, it is extremely important to understand its basic structure, how it works, its ranges as to better determine what is the right type and material of thermocouple for your application.



---

## List of Symbols

TABLE OF CONTENTS

Contents	I
Recommendation	II
Declaration	III
Letter of Forward	IV
Board of Examination and Certificate of Approval Acknowledgements	V
Abstract	VI
List of symbols	VII
CHAPTER 1 INTRODUCTION	1
1.1 General Introduction to thermocouple thermometer	1
1.2 Rationale	2
1.3 Objective	
1.3.1 General objective	
1.3.2 Specific objective	
CHAPTER 2 ;Literature Review	3
CHAPTER 3; Material and Method	4
CHAPTER 4; RESULT AND DISCUSSION	5
CHAPTER 5; CONCLUSION	6
REFERENCE	7

# CHAPTER 1 INTRODUCTION

## 1.1 General Introduction

A thermocouple is a [sensor for measuring temperature](#). This sensor consists of two dissimilar metal wires, joined at one end, and connected to a thermocouple thermometer or other thermocouple-capable device at the other end. When properly configured, thermocouples can provide temperature measurements over wide range of temperatures.

How does a thermocouple work?

When two wires composed of dissimilar metals are joined at both ends and one of the ends is heated, there is a continuous current which flows in the thermoelectric circuit. If this circuit is broken at the center, the net open circuit voltage (the Seebeck voltage) is a function of the junction temperature and the composition of the two metals. Which means that when the junction of the two metals is heated or cooled a voltage is produced that can be correlated back to the temperature.

Thermocouple types

Thermocouples are available in [different combinations of metals or calibrations](#). The most common are the "Base Metal" thermocouples known as N, T, E, J and K Types. There are also high temperature calibrations - also known as Noble Metal thermocouples - Types R, S, C and GB.

Each calibration has a different temperature range and environment, although the maximum temperature varies with the diameter of the wire used in the thermocouple.

Although the thermocouple calibration dictates the temperature range, the maximum range is also limited by the diameter of the thermocouple wire. That is, a very thin thermocouple may not reach the full temperature range.

## 1.2 Rationale

## 1.3 Objectives

### 1.3.2 Specific objectives

The rationales of the project work are as follows:

- 1 To understand the thermocouple thermometer.
- 2 To make applicable real life example to understand thermocouple thermometer.
- 3 To describe the construction method of thermocouple thermometer and the required materials.

### 1.3.1 General objective

The general object of the project can be enlisted as:

- 1 To describe the procedure to construct thermometer.
- 2 To mention the required materials for construction of thermometer.

The specific objectives of the project are as follows:

- 1 To understand use of thermocouple thermometer.
- 2 To relate use of thermocouple thermometer in real life.
- 3 Make applicable model to understand thermocouple thermometer.

## CHAPTER 2 LITERATURE REVIEW

In 1821 a German physicist, Thomas Johann Seebeck, accidentally discovered that the junction between two dissimilar metals generates a voltage that is a function of the junction temperature. As a result of his discovery, this phenomenon is called the Seebeck Effect. The junction is to power deep space vehicles utilizing the heat from small nuclear reactors.

The mechanism behind the thermocouple is fairly simple. When two dissimilar metals or alloys are placed in contact, a transfer of electrons occurs from one to the other. Because they are different metals, there is naturally a difference in their resistivities. Applying Ohm's law,  $V = IR$ , a difference in resistance,  $R$ , and a constant current,  $I$ , produces a difference in the electrical potential or voltage,  $V$ . Likewise, the resistivity of metal is a function of the temperature. The voltage generated by the thermocouple can be measured

## CHAPTER 3

### MATERIAL AND METHOD

#### Construction of Thermocouple

To construct a thermocouple thermometer to investigate the temperature of a Bunsen burner, you will need the following materials:

- Thermocouple wire
- Amplifier circuit (e.g., INA122)
- Display device (e.g., LCD screen or oscilloscope)
- Connecting wires and terminals
- Power supply
- Optional: thermocouple connectors, thermocouple compensating cable

#### Procedure:

1. Connect the thermocouple wire to the amplifier circuit.
2. Connect the amplifier circuit to the display device.
3. Connect the power supply to both the amplifier circuit and display device.
4. Place the thermocouple in close proximity to the Bunsen burner.
5. Observe the temperature reading on the display device.

Note: The accuracy of the thermometer can be improved by using a thermocouple compensating cable and properly calibrating the amplifier circuit.

## CHAPTER 4: RESULT AND DISCUSSION

### Comments:

The thermocouple thermometer construction should be done accordingly to the above mentioned methods. The precautionary

Method should be as follow:

### Precautions:

The precautionary methods adopted for this test are as follows:

1. Surface intended for the experimentation must be clean.
2. Items adopted for this should be properly observed based on the models .
3. Type of material is to be decided beforehand.
4. Masses used in the experimentation should be precisely established.
5. The above mentioned precautions should be followed thoroughly as mentioned.

## CONCLUSION

### CHAPTER 5

The thermocouple thermometer can be used to accurately measure the temperature of the flame of the thermocouple. It is an useful method to determine the temperature. The thermocouple thermometer is even used to measure the temperature of sun. Thermocouple thermometer is very important instrument in the field of physics and would remain useful in many other field and many other study.



## REFERENCE

<https://www.britannica.com/science/tribology>

<https://www.studypool.com/subscription?redirect=/documents/138097>

