

Hong Kong Student Science Project Competition 2022

Template of Extended Abstract (Investigation)

(Word Limit: 1,000 words, Pages: 2 pages only)

Team Number: JBPE093

Project Title: AN INVESTIGATION ON CARBON MONOXIDE

Project Type: Investigation

To our best knowledge and after thorough literature research, as at 30/6/2022 , there ~~are~~/ are no similar works. If there are, the reference links are as below:

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The enhancement our project has made for the existing related products or research is summarized as below:

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***Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.**

I. Background

In Taiwan and Hong Kong, there have been numerous cases of carbon monoxide poisoning while eating hot pots in a not well-ventilated room. An accident of carbon monoxide poisoning taking place in a hot pot restaurant in Wan Chai has raised concern among us. Therefore, we have decided to carry out an investigation on the production of carbon monoxide by hot pots.

II. Objectives

To find out the factors that affect the production of carbon monoxide by hot pots.

III. Hypothesis

When a fire burns in an enclosed room, the oxygen in the room is gradually used up. The fuel is prevented from burning fully and it starts to release carbon monoxide

IV. Methodology

Materials used

- Carbon monoxide sensor
- Oxygen sensor
- Tin box
- Charcoal
- Thermometer
- Alcohol fuel

Experiments 1-4

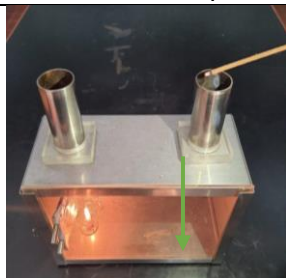
Experiments were carried out to study the production of CO by burning charcoals.

Experiments 5-8

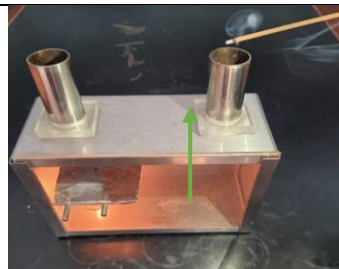
Experiments were carried out to study the production of CO by alcohol fuel used in fast food shops.

V. Results

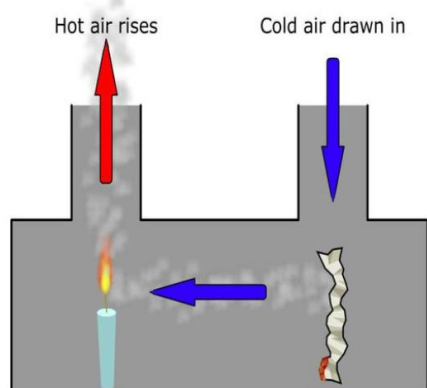
The amount of carbon monoxide in the air increased when a pot was put above the furnace. As the distance between the pot and the furnace increased, the carbon monoxide concentration decreased. To interpret this phenomenon, the convection experiment that was conducted in Form 1 can be used as an explanation. When a candle is lit, the air above will rise due to thermal expansion. The cold air at the lateral sides will sink and form convection. However, when a piece of metal is placed above the fire, the convection cannot be performed.



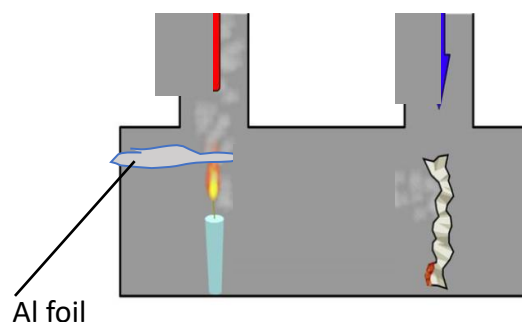
The smoke goes down along the chimney at the right



The smoke goes up along the chimney at the right if the convection current is distorted



The smoke moves with the convection current



The convection current is distorted by the Al foil

Same as placing a pot above the furnace, the air at the lateral sides with more oxygen cannot effectively replace combusted oxygen, which causes incomplete combustion, leading to a sharp rise in carbon monoxide.

VI. Conclusion

Through experiments 1-4, it is discovered that CO was immediately produced after charcoal started to combust. The oxygen concentration of the air around the charcoal before and after combustion did not decrease much, which illustrates the fact that the production of CO is not directly connected to the change of concentration of oxygen. Therefore, it is suggested that people should avoid using charcoal for hotpots. Through experiments 5-8, it is discovered that the pot above the alcohol fuel distorts the convection, which leads to incomplete combustion. Therefore, it is recommended that induction stoves should be used to replace alcohol fuel. Also, the restaurants should limit the number of furnaces being used at the same time to monitor and reduce the CO concentration in an enclosed area.

□ Our project is developed based on our school's previous project and the enhancement is as below: