Greenhouse Effect

Purpose

Using "Borderless Lab 365" platform to study the Greenhouse effect by measuring the temperature change through the experiment setup.

Theory

- The atmosphere of Earth contains water vapour, carbon dioxide, methane, nitrous oxide, ozone and F-gases that scientists refer to as greenhouse gases. Greenhouse gases absorb this infrared radiation and trap the heat in the atmosphere.
- Greenhouse effect is a natural process that maintains the earth's temperature and supporting life.
- However, intensive human activities, mainly burning fossil fuels and clearcutting of forests, dramatically increase the greenhouse gases which trap additional Sun's energy to excessive warm our planet.
- In this experiment, we will study the ability of an intensified CO_2 atmosphere to absorb heat as compared with an air atmosphere.
- A controlled experiment will be conducted with two glass domes. CO_2 is added in one glass dome as experimental setup, but not in another as a control. Turn on the light bulb and observe temperature changes of two glass domes. (Fig. 1)

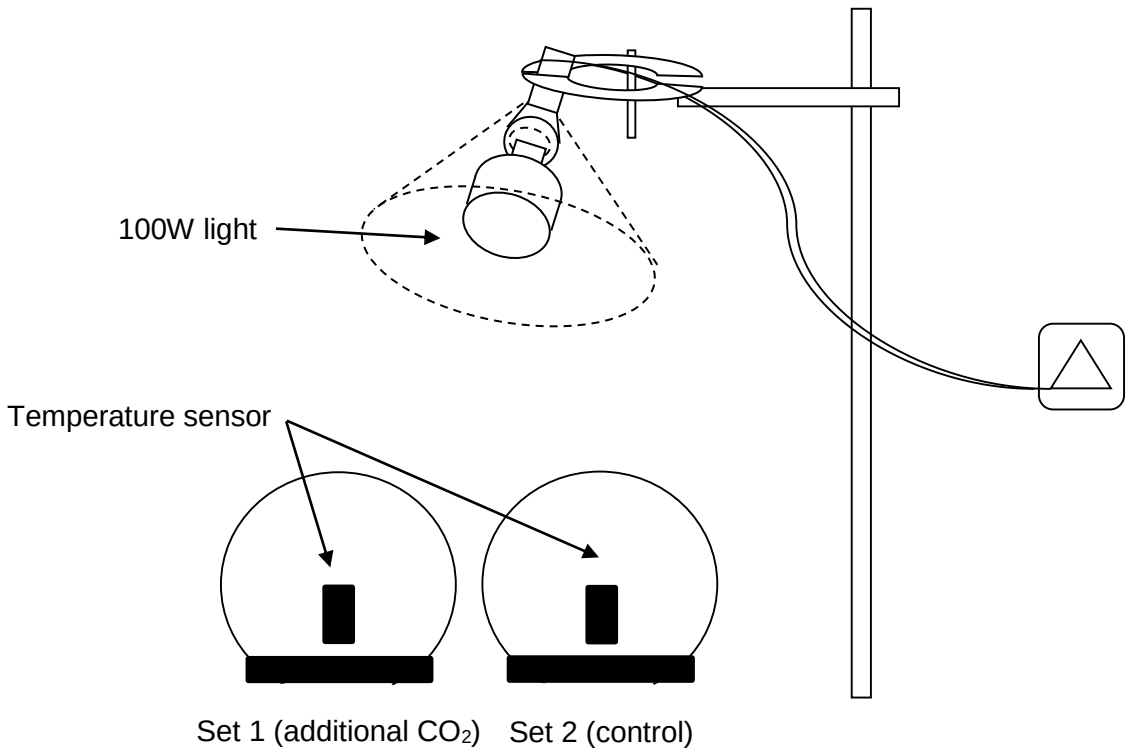

Fig. 1 Experimental setup to observe the greenhouse effect.

Apparatus

- "Borderless Lab 365" Platform
- 2 glass dome inserted with temperature sensor
- 100W light bulb
- Air for flushing and CO_2 Pulse

Procedure

1. Log in the experiment module "Greenhouse" on the Borderless Lab 365 platform. https://stem-ap.polyu.edu.hk/remotelab/
2. Check the initial temperature of two glass domes. Press "On" under Flush on the right of the control panel to pump the fresh air to both sets and narrow temperature difference between two sets.
3. Press "Off" when temperature of two sets are nearly the same.
4. Press "ADD CO2" to pump a pulse of CO_2 into Set 1. Click **ONCE** only and wait for couple seconds until CO_2 sensor responses. (Max. value 5000)
5. Press "On" under the Sun to turn on the light bulb and click "Start capture" to record the temperature change.
6. Measure for around 45 minutes.
7. Stop capture and Press "Export" to output the data.
8. Turn off the light bulb by pressing "Off" under Sun and Click "logout" to finish the experiment.

Data

Time (mins)	Set 1 (Additional CO_2) Temperature / °C	Set 2 (Control setup) Temperature / °C	Temperature Difference / °C
Initial			
5			
10			
15			
20			
25			
30			
35			
40			
45			

Discussion

1. Is the result of the experiment supporting the theory of greenhouse effect?
2. Why we need to narrow the temperature difference of the 2 sets before we start to measure?
3. What are the possible errors of the experiment?
4. Do you think greenhouse gases impacting you daily life? Why?