THE EFFECT OF CO_2 ON THE ATMOSPHERE

Information sheet

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CO_2 is a gas that has a significant effect on the climate. The effect of CO_2 on the temperature increase is often called into question. The goal of the experiment suggested below is to illustrate the effect of a heightened CO_2 concentration in the atmosphere.

Conducting the experiment (see also the video provided)

The experiment is arranged so that two small containers of air are placed on a table next to each other. In one of the two containers the air is enriched with CO_2. This is done by dissolving several effervescent tablets in a small plastic bottle (green bottle) filled with a small amount of water. With a short hose the generated CO_2 is fed into the container. The CO_2 concentration (which should be >10%) can be documented with the CO_2 measuring device (infrared absorption) included in the building block materials. Following this step, the open containers are irradiated with a 500W light (mounted as high as possible) to represent the sun. Using two sensitive thermal elements the air temperature is measured over time.

By using the strong radiation of the light to warm the surface area (thereby increasing the emmissions as thermal long wave radiation) an increased absorption in the CO_2 enriched atmosphere occurs, leading to signnificantly greater temperature increases in the CO_2 enriched container.
The only difference between the containers rests in the CO_2 concentration, which can be verified using the accompanying CO_2 measuring device (the CO_2 concentration should be >10% in order to see an effect).

Application in the course

In preparation for the experiment the spectral characteristics of solar (short wave) and terrestrial (long wave) radiation in relation to the components of the atmosphere, particularly greenhouse gases (H_2O, CO_2, etc.) should be discussed.
The experiment can be conducted in front of a large group of students in a lecture hall or as a part of individual and group projects. The trial takes around 5 minutes to complete. The results of the CO_2 measurements and the temperature development are recorded for discussion. At the end of the experiment the resulting temperature changes are presented and discussed.

Description of Equipment

The necessary pieces of experiment are shown in Figure 1:

- 2 transparent plastic containers, open at the top
- 500 W light (mounted as high as possible)
- Thermal element measuring device with two thermal elements
- CO_2 measuring device
- Green plastic bottle with hose to transport the CO_2 generated by the effervescent tablets

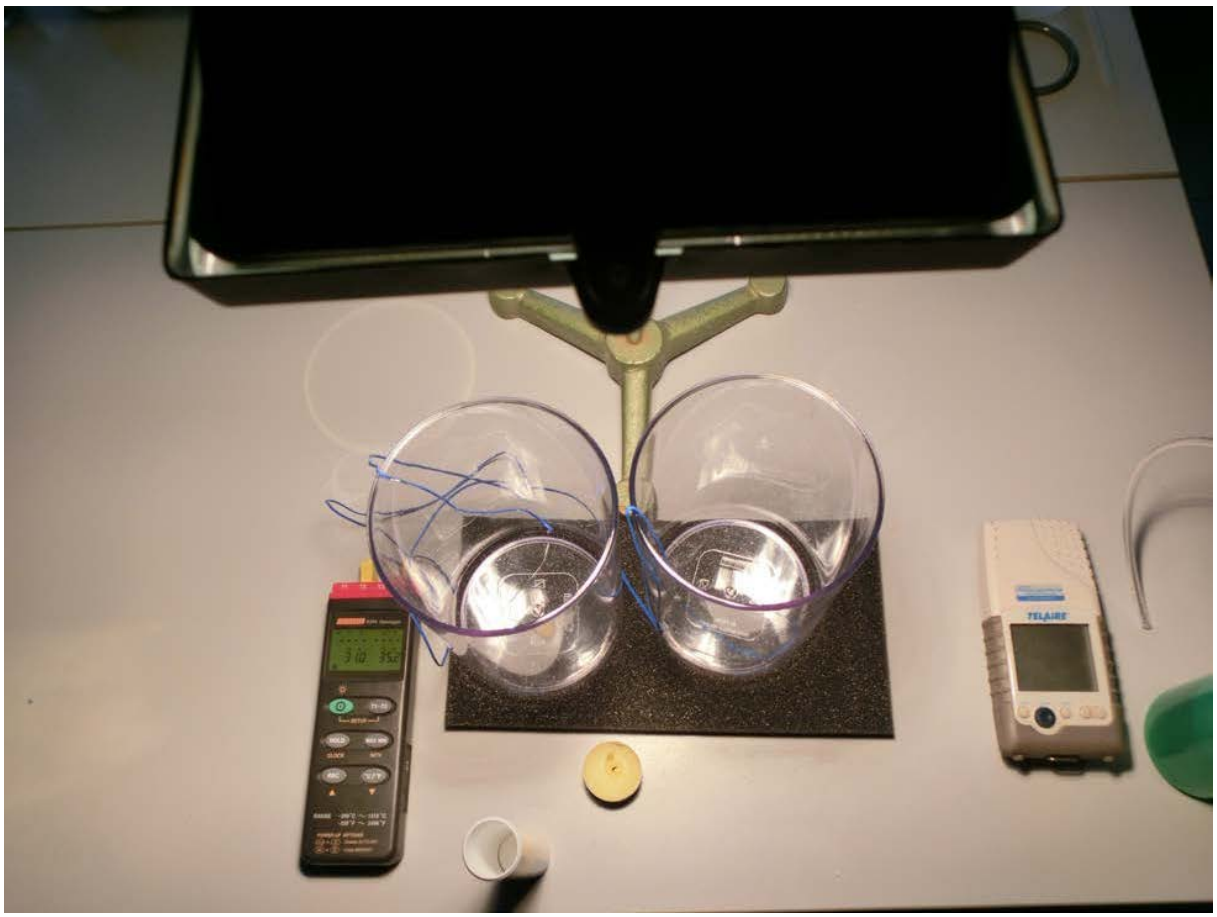

Figure 1: Components of CO_2 experiment