

# INFLUENCE OF CO<sub>2</sub> CONCENTRATION IN THE ENVIRONMENT ON THE USE OF FILTERING RESPIRATORY PROTECTION

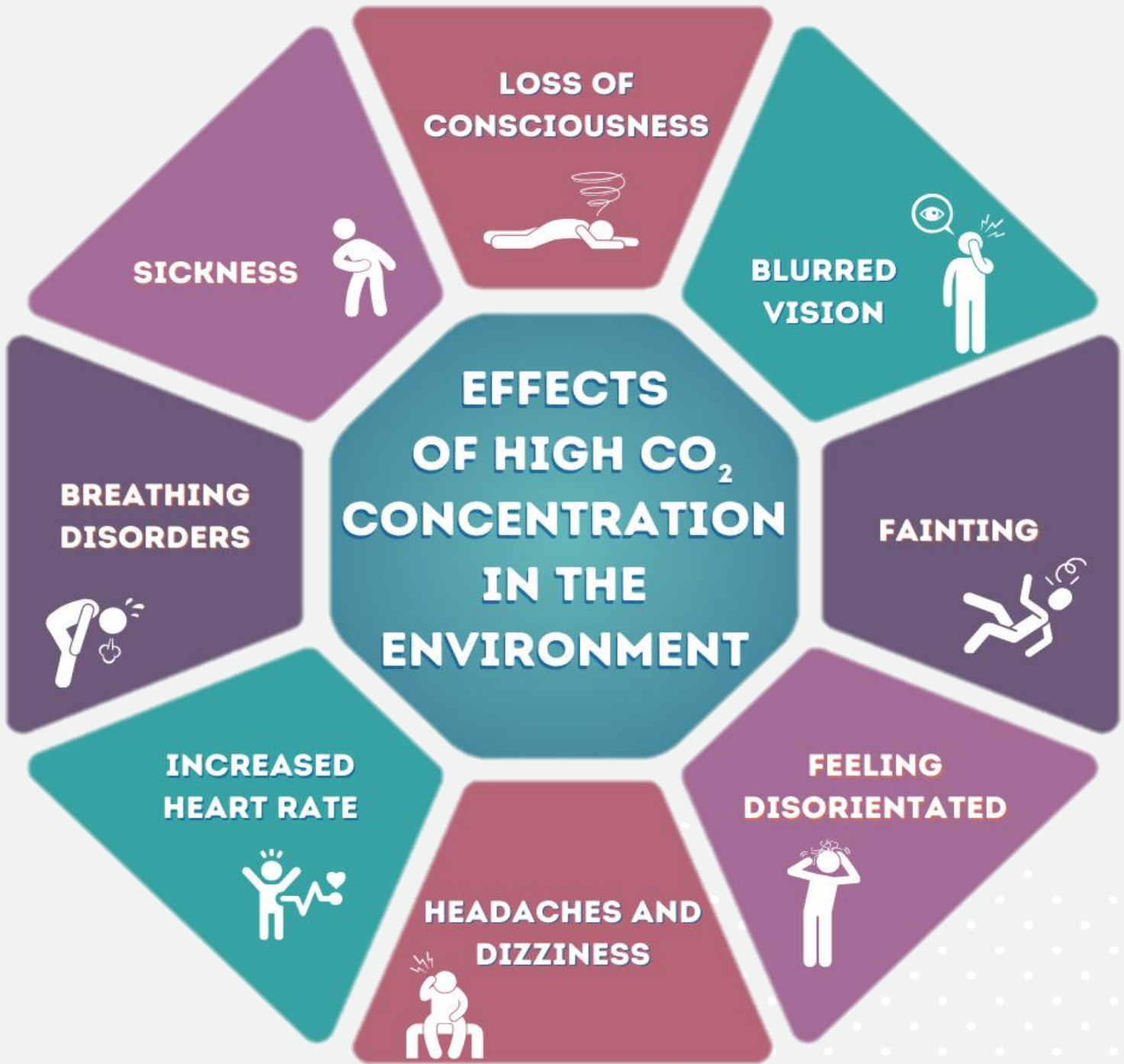
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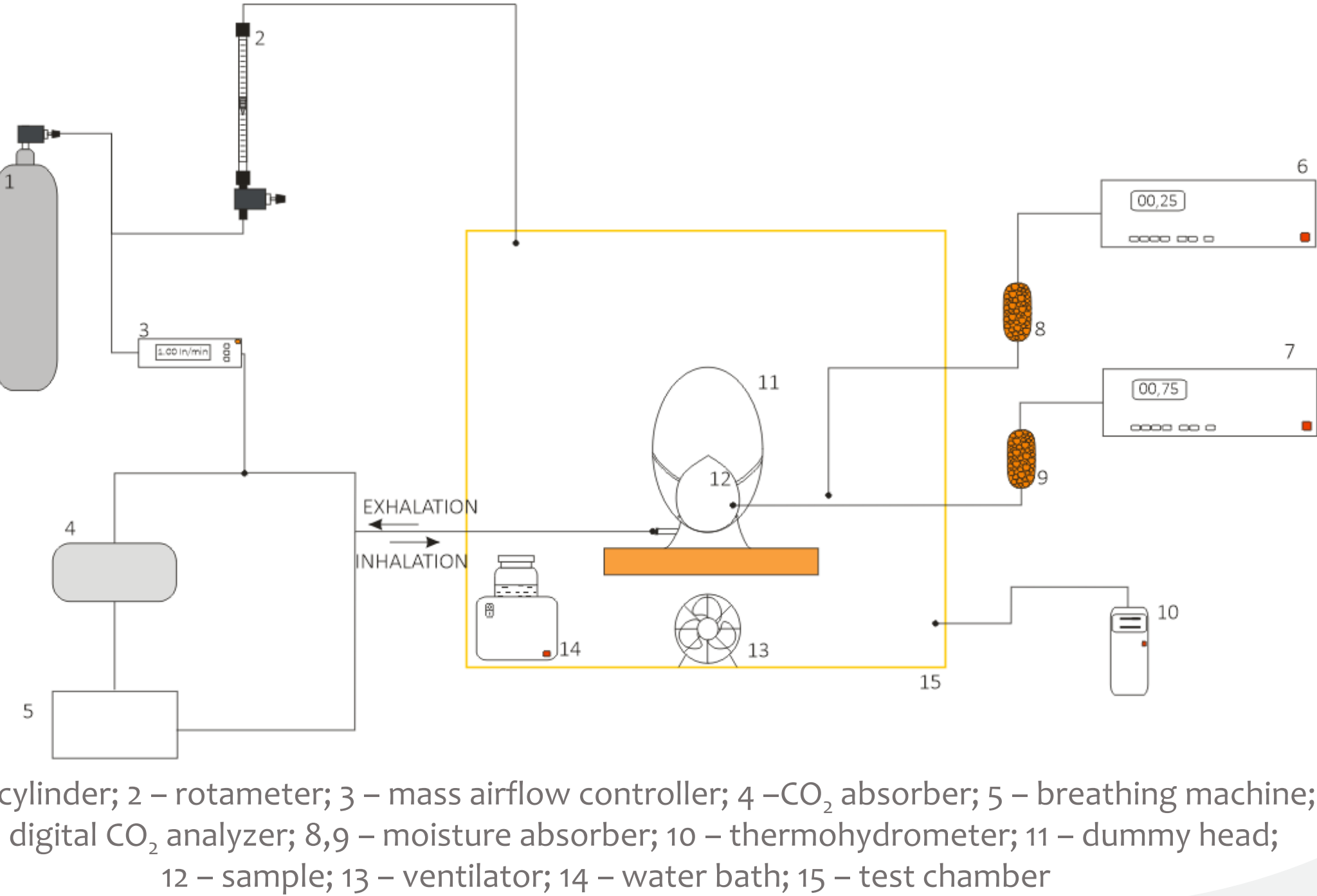


## Introduction

Carbon dioxide (CO<sub>2</sub>) is a greenhouse gas, invisible and imperceptible to human senses, and because it is heavier than air, it tends to accumulate in the lower layers of the atmosphere, where it leads to oxygen deficiency. The systematic increase in CO<sub>2</sub> concentration in the atmosphere (including as a result of industrial emissions) contributes to global climate warming, but the high concentration of this gas in workplaces is also a problem. The level of CO<sub>2</sub> concentration in the environment is a good indicator of the effectiveness of the ventilation system and a good measure of the quality of air inside buildings where a significant number of people work. People produce CO<sub>2</sub> when breathing, which increases the value in rooms, and everyone produces about 20L of CO<sub>2</sub>/h. The CO<sub>2</sub> reference value of 0.1% is considered the minimum hygienic level ensuring comfort and safety. Exceeding this value may lead to discomfort, loss of concentration and other symptoms. CO<sub>2</sub> concentration in workplaces can vary and depends on many factors, including the type of activity, production processes, ventilation level, number of employees and other environmental factors. Measurements taken in school and university rooms reached up to 0.7% by vol. Increased CO<sub>2</sub> concentrations may also occur in areas of the economy such as the chemical, metallurgical, food and agricultural industries, but also in construction and offices. Laboratory of CIOP-PIB investigated the impact of changes in CO<sub>2</sub> concentration on the comfort of using filtering half masks of various designs.



## Methods

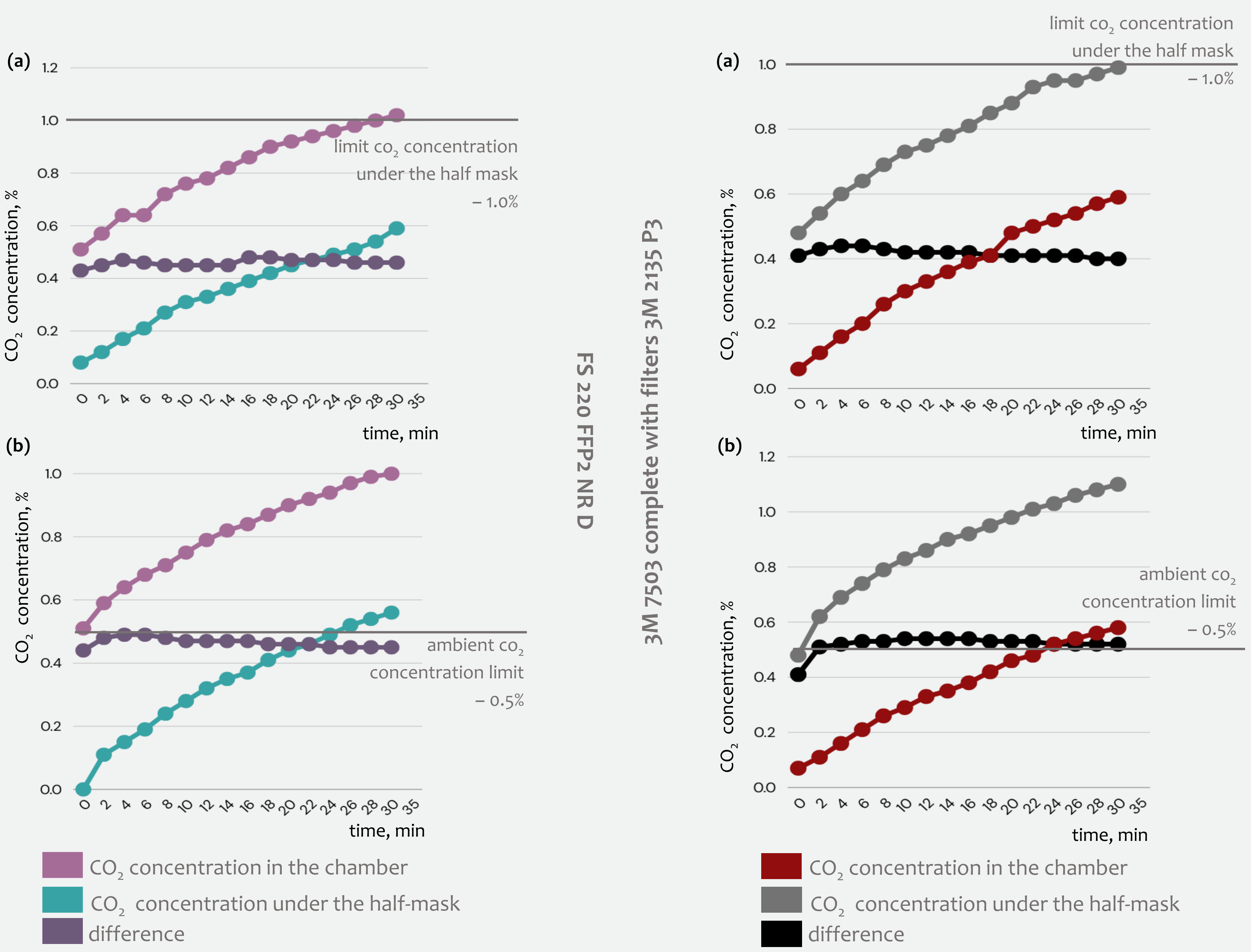


Increased CO<sub>2</sub> concentration in the environment can double the time required to safely use a filtering half-mask

- 01 In order to minimize the impact of CO<sub>2</sub> growth on the comfort of using the filter seal, you should choose the appropriate half-mask model and provided its good fit to the face.
- 02 The need to regularly control and replace the filter half-mask due to the potentially dangerous "dead space" formed under the facial part.
- 03 In high humidity conditions, the time of safe use of filtering half-mask is shortened.
- 04 Taking care of air quality in workplaces and the use of appropriate respiratory protection measures is of great importance to ensure the comfort and safety of employees.

## Results

The charts show exemplary test results for a filtering half-mask and a rubber half-mask complete with filters. The increase in the content of CO<sub>2</sub> concentration under the facial part of the half-mask is constant and proportional to the increase in CO<sub>2</sub> concentration in the environment. The influence of an increase in ambient CO<sub>2</sub> concentration on the CO<sub>2</sub> concentration under the face part of filtering half masks was examined:  
(a) high humidity conditions (T=22.0°C, Rh=100%), (b) ambient conditions (T=24.4°C, Rh=67.8%)



## Conclusions

### ENVIRONMENTAL CONDITIONS

increased air humidity affects the fit of the half-mask to the head model (especially a rubber half-mask, where higher air humidity results in better adhesion of the material from which the half-mask body is made) and on the safe use of the half-mask.

### FIT OF THE FILTERING HALF-MASK

ensures low CO<sub>2</sub> concentration values under the face part, which is associated with greater comfort of using the half mask and work safety during professional activities.

### SAFE USE TIME

it has been shown that in conditions of high CO<sub>2</sub> concentration in the work environment, the safe use of filtering half masks is short.