



LABORATORY

Volatile Organic Compounds Lab (VOC Lab)

Laboratory for research and industry for indoor air quality measurements, building material emission characterization and sensor testing

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The rising awareness of the harmful effects of pollutants on human health has increased the attention on the indoor air quality (IAQ). Many building products used indoors such as wall panels, paints, furniture, or adhesives contain organic chemicals that can vaporize and cause contamination. To ensure healthy and comfortable indoor air, our lab can characterize formaldehyde and Volatile Organic Compounds (VOC) emissions from building materials. Alternatively, smart materials are currently being developed by the building industry to reduce airborne pollution and improve IAQ. The laboratory evaluates the VOC removal performance of these materials under controlled conditions of temperature and humidity.

In addition, a suitable IAQ monitoring system is essential to maintain healthy air. Low-cost sensors are a powerful tool for managing IAQ, however over time, sensor drift frequently occurs, leading to a misguided increase or decrease of pollution trends. In our lab, we perform the testing and calibration of IAQ sensors to minimize uncertainty of measurements and provide high quality data.

VOC and formaldehyde emission test chambers

The laboratory consists of two VOC and formaldehyde emission test chambers (1 m³ and 6 m³) both fully compliant with the main standard methods for VOC and formaldehyde emission tests (EN 717-1, ISO16000-9, EN 16516, ASTM D5116, etc.). The chambers can be used to test a broad spectrum of furniture and building materials including plywood, wallpaper, adhesives, fabrics, flooring, insulation, wall panels and coverings, paints, and coatings. The inner walls of the chambers are made of stainless steel to prevent the adsorption of the VOC generated from the specimen, ensuring accurate testing. A clean air producing unit constantly provides clean air to the chambers and maintains a total VOC (TVOC) value of less than 20 µg/m³ for the background concentration prior the test.

The emission test chambers are airtight to avoid uncontrolled air exchange with ambient air. They are thermally isolated and equipped with heating elements which allow the temperature inside the chamber to be controlled. The temperature can be regulated from 23°C to 65°C within the 1 m³ test chamber and between 23 and 50°C in the 6 m³ chamber. Relative humidity (RH) can be controlled to any value between the RH value of the inlet air and 80% RH at 23°C. Air velocity inside the chambers can be also modified according to the experimental requirements.

The main tests carried out in our laboratory are:

- Emission tests: gaseous chemicals emitted by the test specimens are monitored over an interval of time (days/weeks).
- Decay tests: the ability of the test specimen to remove airborne chemicals is evaluated over an interval of time (days/weeks).

- Sensor testing and calibration: sensors are tested under different concentrations, conditions of temperature and relative humidity. Sensor readings are compared to reference instruments.

During these tests, two types of measurements are taken:

- Real-time formaldehyde measurements: a fluorimeter is connected to the chamber and the formaldehyde concentration inside the chamber is monitored in real time.
- Off-line VOC measurements: air samples are collected from the chamber at specific time intervals using sampling cartridges. These cartridges are later analyzed in the lab using standard analysis methods.

Services for businesses

In the VOC lab, emission testing can be conducted in a wide variety of conditions including those in accordance with standard requirements. Thanks to proficient knowledge in gaseous pollutants measurement and indoor air quality, Eurac Research experts can assist companies in the development and characterization of innovative materials for the building industry. The experimental data obtained can be used as inputs for IAQ models to predict VOC concentrations in standard building scenarios.

Additionally, our test chambers can be used for the testing and calibration of sensors in fully controlled conditions. In our lab, the influence of temperature, relative humidity, and the presence of other chemicals in the sensor signal can be evaluated providing valuable information to sensor manufacturers for the development of correction models.

