

Bomb calorimeter

Functional Principle:

A bomb calorimeter (also Berthelot bomb, named after Marcelin Berthelot, or calorimetric bomb) is used to determine the calorific value of a substance under an oxygen atmosphere and high pressure. The bomb calorimeter C200 is suitable for the determination of calorific values of liquid and solid samples.

The calorific value is measured in accordance with DIN 51900, ISO 1928; ASTM D240, ASTM D4809, ASTM D5865, ASTM D1989, ASTM D5468, ASTM E711.

C 200 system consisting of:

- Basic device (measuring cell) C 200
- RC2 basic Circulating chiller
- Decomposition vessel C 5010
- Oxygen station C 248 (Oxygen filling station)

Equipment

- Briquetting press C21 (Manual pellet press for powdery, easily combustible substances)
- incinerator set C 5 VA
- Cotton threads, cut to length with a known calorific value C 710.4
- Benzoic acid tablets C 723 with IKA certified calorific value suitable for standard calibrations according to DIN 51900

Bomb calorimeters consist of a steel container filled with tempered water (typically 2,000 g), which can be assumed to be adiabatic and in which, in addition to the actual bomb made of high-strength chrome steel, there is a stirrer and a thermometer. In the bomb, which typically has an internal volume of 340 cm³, there is a suspension for a crucible. The suspension also serves as an electrical conductor for the ignition wire, which lies in the substance to be burned. It is then ignited either by an arc or by the heat of the current-carrying ignition wire. The combustion takes place at an oxygen pressure of around 20–30 bar. A solid (0.5–1.5 g) in the form of a so-called pellet is usually burned. The mechanical cohesion of the pellet in pill form means that the explosively rapid burning occurs essentially only on the surface of the pill. This prevents incompletely burned parts of the sample from being thrown out of the crucible and from being cooled down on the cold wall of the bomb to below the flash point and therefore not burning completely. During the combustion, the temperature in the bomb increases, this heat is then given off to the water and the temperature change in the water is then precisely measured with a thermometer. By measuring the temperature rise of the bomb calorimeter, conclusions can be drawn about the calorific value. With the help of a calorimeter, the specific heat capacity of a substance can also be determined.

The calorific value describes the energy content of a substance that can be used as heat by simply burning it. According to the calorific value definition, on the other hand, the value

indicates how much thermal energy a heating system can gain if it also extracts energy from the combustion gases. The calorific value H_i (inferior; previously the lower calorific value H_u) is the maximum thermal energy that can be used during combustion without condensation of the water vapor contained in the exhaust gas, based on the amount of fuel used.

The calorific value is referred to as the thermal energy that arises from the combustion and condensation of the water vapor from one kilogram of fuel. It is the chemical energy contained in the liquid, gaseous or solid fuel. This is also called the "enthalpy of reaction".

**Basic device (measuring cell) C 200
RC2 basic Circulating chiller/**



Briquetting press C21



Decomposition vessel C 5010



Oxygen station C 248 (Oxygen filling)



1. Cotton threads, cut to length with a known calorific value C 710.4
2. incinerator set C 5 VA
3. Benzoic acid tablets C 723 with IKA certified calorific value suitable for standard calibrations according to DIN 51900

Laborausstattung

RES
Professur für Regenerative Energiesysteme



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