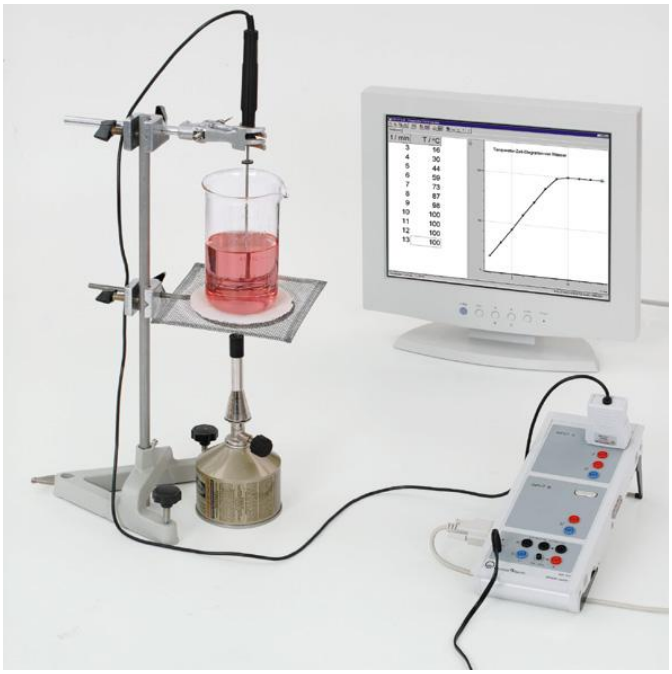
Changes of the state of aggregation
Boiling and condensation
Warming up water until it boils -
Measurement with Sensor-CASSY and PC

Objects of the experiment

1. Observing the warming of water until it boils
2. Recording a temperature-time diagram

Setup



Preparing the temperature measurement:

- Put the Sensor-CASSY into operation.
- Connect the temperature sensor S to Input A.
- Get CASSY Lab started.
- Make the following settings:

Settings sensor input:
Measurement quantity: temperature ϑ_A
Measuring range: 0 °C – 120 °C
Data logging: instantaneous values
Zero: left

Measuring parameters:
Automatic Recording
Interval: 30 s

Evaluation:
Select Value Display → Show Values

Apparatus

1 Temperature sensor S, NTC	524 044
1 Sensor-CASSY 2	524 013
1 CASSY Lab 2	524 220
1 Beaker, Boro 3.3, 400 ml, squat	664 131
1 Glass rod, 200 mm, 5 mm diam	602 782
1 Butane gas burner	666 714
1 Butane cartridge, 190 g, set of 3	666 712ET3
1 Stand base, V-shaped, small	300 02
1 Stand rod, 75 cm, 12 mm diam.	300 43
2 Leybold multiclamps	301 01
1 Universal clamp, 0…80 mm	666 555
1 Stand ring with stem, 100 mm diam.	666 573
1 Wire gauze, 120 x 120 mm	608 120
1 Colouring, red, 10 g	309 42

Carrying out the experiment

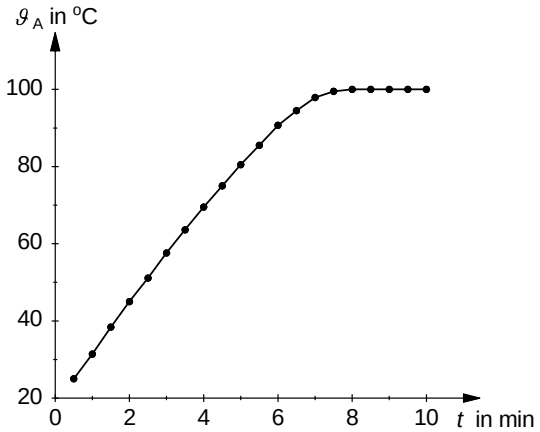
- Start the measurement with CASSY Lab and warm the water with the cartridge burner until it boils. Stir the water permanently while it warms up.
- Observe the process of warming and the data recording.

Observation and measuring example

- At approx. 50 °C, small air bubbles form on the wall of the beaker and rise to the surface.
- At approx. 85 °C, bigger steam bubbles form on the bottom of the beaker.
- At 100 °C, the steam bubbles rise to the surface.

Time t in min	Temperature ϑ_A in °C
0.5	25.0
1.0	31.4
1.5	38.4
2.0	45.0
2.5	51.1
3.0	57.6
3.5	63.6
4.0	69.5
4.5	75.0
5.0	80.5
5.5	85.5
6.0	90.7
6.5	94.5
7.0	97.9
7.5	99.5
8.0	100.0
8.5	100.0
9.0	100.0
9.5	100.0
10.0	100.0

Evaluation



If heat is transferred to a certain quantity of water, the temperature of the water increases continuously until it reaches the boiling temperature. After the boiling temperature has been reached, the temperature no longer increases although heat is transferred. The water begins to evaporate.

Remark:

The boiling temperature depends on the pressure. At a pressure of approx. 1013 hPa, the boiling temperature is 100°C.

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