1.2.3 Boiling point

The boiling point of a liquid is the corrected temperature at which the liquid boils under normal atmospheric pressure when determined by the method described below.

Apparatus

A suitable apparatus for the determination consists of a vessel with appropriate liquid, a source of heat, and a thermometer, as described under A for the determination of melting temperature and melting range for pulverizable substances; also needed are a thin-walled test-tube of glass of external diameter about 4 mm and length suitable for the apparatus used and a thin-walled capillary tube of glass of internal diameter not exceeding 1 mm, which should be closed by fusing about 2 mm from one end.

Recommended procedure

Transfer 3-4 drops of the liquid to be tested (or the equivalent quantity of a solid compound) to the test-tube. Place the capillary tube (fused end down) in the test-tube and introduce the test-tube into the heating bath in such a way that its lower end is at the level of the middle of the bulb of the thermometer. Heat the bath rapidly with constant stirring to a temperature about 10 °C below the expected boiling point, then regulate the heating so that the temperature rise is 1-2 °C per minute. During the heating bubbles begin to escape from the lower end of the capillary tube, slowly at first but then more rapidly as the temperature approaches the boiling point. Read the temperature at which bubbles are released in an even rapid stream and then decrease the heating so that the temperature of the bath falls 1-2 °C per minute. Read the temperature at which the release of bubbles ceases. The boiling point is taken as the average of the two temperatures, corrections for emergent-stem of the thermometer and for deviation from normal atmospheric pressure being applied as necessary. Obtain the emergent-stem correction as described under A for the determination of melting temperature and melting range of pulverizable substances. If the determination is made at a barometric pressure that deviates from 101.3 kPa (760 mmHg), add to the temperatures the following correction:

$$k(p - p_1)$$

where p is the standard barometric pressure;

p_1 is the barometric pressure read on a mercury barometer, without taking into account the temperature of the air; and

k is the boiling temperature increment, as indicated below.

For pressures read on a barometer calibrated in kPa, use the following data:

p = 101.3

k = 0.3 (boiling temperature increment produced by a rise of pressure of 1 kPa), unless otherwise specified in the monograph.

For pressures read on a barometer calibrated in mmHg, use the following data:

p = 760

k = 0.04 (boiling temperature increment produced by a rise of pressure of 1 mmHg), unless otherwise specified in the monograph.