BUREAU OF ANALYSED SAMPLES LTD

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BRITISH CHEMICAL STANDARD REFERENCE MATERIAL

ANALYSIS REPORT
BCS-RM No. 190t
BENZOIC ACID
Thermochemical Standard

(WITH ENERGY OF COMBUSTION CERTIFIED BY PATTINSON AND STEAD, MIDDLESBROUGH, UK)

ENERGY OF COMBUSTION (CALORIFIC VALUE)

26,439.7 ± 12.2 joules per gram based on mass

(see Certificate of Measurement overleaf for details)

ANALYSIS

		%			%
Benzoic Acid	…	**100.0 ± 0.05**	**Non volatile residue**	…	**<0.005**
Chlorine	…	**<0.01**	**Moisture**	…	**<0.01**
Heavy Metals	…	**<0.001**	**Gums, Cinnamic or other organic acids**	…	**not detected**
Sulphate	…	**<0.002**			

STANDARD FOR ACIDIMETRY

Standard solutions of sodium and potassium hydroxide must be free from carbonates. Sodium hydroxide solution may be prepared sufficiently free from carbonates to be suitable for use with phenolphthalein by dissolving say 100g in an equal weight of water, allowing the sodium carbonate to settle out and pipetting off the clear solution before diluting for use.

To standardise with this benzoic acid, weigh off a suitable quantity (e.g. 1.8318g* ≡ 30.0ml M/2 NaOH or 1g ≡ 55.15ml M/6.735 NaOH), dissolve in 20 – 30ml alcohol (industrial alcohol may be used if previously neutralised with M/2 NaOH using phenolphthalein indicator), add a few drops of 1% phenolphthalein in alcohol and titrate. For work of the highest accuracy the solution should be in a flask that has been swept free from carbon dioxide (see Hillebrand, Lundell, Bright and Hoffman, "Applied Inorganic Analysis", 1953, p.181)

* Based on 2001 Atomic Weights (*Pure Appl. Chem.*, Vol. 75, No 8, pp. 1107-1122, 2003)

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For BUREAU OF ANALYSED SAMPLES LTD.
P.D. RIDSDALE,
Chairman

August 2004

PATTINSON & STEAD
CONSULTING ANALYSTS
MARTON MIDDLESBROUGH ENGLAND

CERTIFICATE OF MEASUREMENT

ENERGY OF COMBUSTION OF BCS-RM 190t BENZOIC ACID

The energy of combustion of a sample of benzoic acid BCS-RM 190t was measured using an adiabatic bomb calorimeter. The calorimeter was calibrated using Certified Reference Material BCS-CRM 190s, following the British Standard Method BS 1016 part 105

The energy of combustion of BCS –RM 190t is reported, based on the absolute mass of benzoic acid (when weighed in vacuum):-

Energy of combustion under standard bomb conditions as stated below:

26,439.7 ± 12.2 joules per gram

The standard bomb conditions are:

(1) An initial pressure P (absolute) of oxygen at 30 bar at 25°C in the combustion bomb.

(2) The mass of sample m_b and the mass of water m_w (in grams) added to Bomb are each three times the internal volume V (in litres)

(3) The initial temperature of the combustion reaction t is 25°C

Small deviations from these conditions can be corrected by multiplying the energy of combustion by the factor f as follows:

$$f = 1 + 10^{-6}\left[20(\mathrm{P} - 30) + 42\left(\frac{m_b}{\mathrm{V}} - 3\right) + 30\left(\frac{m_w}{\mathrm{V}} - 3\right) - 45(t - 25)\right]$$

The calorimetric measurements for this certificate were made by Dr N. Bentley, Pattinson & Stead, Middlesbrough.

Dated 21st June 2004

Signed: D G Heywood M Inst M&C MRSC