Status: Currently Official on 14-Feb-2025
Official Date: Official as of 01-Aug-2013
Document Type: NF Monographs
DocId: GUID-DC08C125-E6D0-414B-82F9-99A7047F62B2_1_en-US
DOI: https://doi.org/10.31003/USPNF_M10890_01_01
DOI Ref: ep4qq

Butane

C_4H_{10} 58.12

n-Butane CAS RN®: 106-97-8.

DEFINITION

Butane contains NLT 97.0% of butane (C_4H_{10}).

[**Caution—**Butane is highly flammable and explosive.]

IDENTIFICATION

- **A. Infrared Absorption:** Exhibits maxima, among others, at the following wavelengths, in µm: 3.4 (vs), 6.8 (s), 7.2 (m), and 10.4 (m)
- **B.**

Sample: Use an empty stainless steel cylinder equipped with a stainless steel valve, having a capacity of NLT 200 mL, and a pressure rating of 240 psi or more. Dry the cylinder with the valve open at 110° for 2 h, and evacuate the hot cylinder to less than 1 mm of mercury. Close the valve, cool, and weigh. Connect one end of a charging line tightly to the butane container and the other end loosely to the empty cylinder. Carefully open the butane container, and allow the butane to flush out the charging line through the loose connection. Avoid excessive flushing, which causes moisture to freeze in the charging line and connections. Tighten the fitting on the empty cylinder, and open the empty cylinder valve, allowing the butane to flow into the evacuated cylinder. Continue sampling until the desired amount of butane is obtained, then close the butane container valve, and finally close the sample cylinder valve. [**Caution—**Do not overload the sample cylinder; hydraulic expansion due to temperature change can cause overloaded cylinders to explode.] Weigh the charged sample cylinder, and determine the weight.

Analysis: Determine the vapor pressure of the *Sample* at 21° by means of a suitable pressure gauge.

Acceptance criteria: 205–235 kPa absolute (30–34 psia)

ASSAY

- **Procedure**

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: GC

Detector: Thermal conductivity

Column: 3-mm × 6-m aluminum; packed with 10 weight percent of liquid phase G30 on support S1D

Column temperature: 33°

Carrier gas: Helium

Flow rate: 50 mL/min

Injection volume: 2 µL

System suitability

Sample: *n*-Butane

Suitability requirements: The peak responses of *n*-butane in the chromatograms from duplicate determinations agree within 1%.

Analysis

Samples: Connect one Butane cylinder to the chromatograph through a suitable sampling valve and a flow control valve downstream from the sampling valve. Flush the liquid specimen through the sampling valve, taking care to avoid entrapment of gas or air in the sampling valve.

Calculate the purity by dividing 100 times the *n*-butane response by the sum of all of the responses.

Acceptance criteria: NLT 97.0%

SPECIFIC TESTS

- **High-Boiling Residues**

Sample: Use the *Sample* from *Identification* test *B*.

Analysis: Prepare a cooling coil from copper tubing (about 6-mm outside diameter × about 6.1-m long) to fit into a vacuum-jacketed flask. Immerse the cooling coil in a mixture of dry ice and acetone in a vacuum-jacketed flask, and connect one end of the tubing to the *Sample*. Carefully open the sample cylinder valve, flush the cooling coil with about 50 mL of the *Sample*, and discard this portion of liquefied sample.

Continue delivering liquefied sample from the cooling coil, and collect it in a previously chilled 1000-mL sedimentation cone until the cone is filled to the 1000-mL mark. Allow the sample to evaporate, using a warm water bath maintained at about 40° to reduce evaporating time. When all of the liquid has evaporated, rinse the sedimentation cone with two 50-mL portions of pentane, and combine the rinsings in a tared 150-mL evaporating dish. Transfer 100 mL of the pentane solvent to a second tared 150-mL evaporating dish, place both evaporating dishes on a water bath, evaporate to dryness, and heat the dishes in an oven at 100° for 60 min. Cool the dishes in a desiccator, and weigh. Repeat the heating for 15-min periods until successive weighings are within 0.1 mg, and calculate the weight of the residue obtained from the *Sample* as the difference between the weights of the residues in the two evaporating dishes.

Acceptance criteria: NMT 5 µg/mL

- **Acidity of Residue**

Sample solution: Add 10 mL of water to the residue obtained in the test for *High-Boiling Residues*.

Analysis: Mix the *Sample solution* by swirling for 30 s, add 2 drops of methyl orange TS, insert the stopper in the tube, and shake vigorously.

Acceptance criteria: No pink or red color appears in the aqueous layer.

- **Limit of Sulfur Compounds**

Analysis: Carefully open the container valve to produce a moderate flow of gas. Do not direct the gas stream toward the face, but deflect a portion of the stream toward the nose.

Acceptance criteria: The odor is free from the characteristic odor of sulfur compounds.

- **Water Determination** ⟨921⟩

Sample: 100 g of the *Sample* from *Identification* test *B*

Analysis: Proceed as directed in the chapter with the following modifications. (a) Provide the closed-system titrating vessel with an opening through which passes a coarse-porosity gas dispersion tube connected to a sampling cylinder. (b) Dilute the *Reagent* with anhydrous methanol to give a water equivalence factor of 0.2–1.0 mg/mL; age this diluted solution for NLT 16 h before standardization. (c) Introduce the *Sample* into the titration vessel through the gas dispersion tube at a rate of about 100 mL/min; if necessary, heat the sample cylinder gently to maintain this flow rate.

Acceptance criteria: NMT 0.001%

ADDITIONAL REQUIREMENTS

- **Packaging and Storage:** Preserve in tight cylinders, and prevent exposure to excessive heat.

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
BUTANE	Documentary Standards Support	SM42020 Small Molecules 4

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
Pharmacopeial Forum: Volume No. PF 38(3)

Current DocID: GUID-DC08C125-E6D0-414B-82F9-99A7047F62B2_1_en-US
DOI: https://doi.org/10.31003/USPNF_M10890_01_01
DOI ref: ep4qq