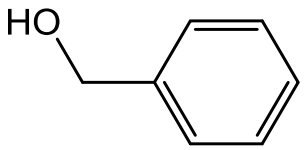
Certificate of Analysis

ISO GUIDE 34
ANAB Cert# AR-1470

ISO/IEC 17025
ANAB Cert# AT-1467

BENZYL ALCOHOL

CERTIFIED REFERENCE MATERIAL



CERTIFIED PURITY: 99.95%, U_{crm} = ±0.04% k = 2.04
(Mass Balance/as is basis)

NOMINAL PACKAGE SIZE: 1g

CATALOG #: PHR1019 **LOT #:** LRAA7309

CERTIFICATE VERSION: LRAA7309.4 **ISSUE DATE:** 31 October 2017
Note: Certificates may be updated due to Pharmacopeial Lot changes or the availability of new data. Check our website at: www.sigma-aldrich.com *for the most current version.*

CRM EXPIRATION: 31 December 2019 (Proper Storage and Handling Required).

RECEIPT DATE: _____
Note: this space is provided for convenience only and its use is not required.

STORAGE: Store at Room Temperature/Protect from Light, keep container tightly closed. Transfer unused portions to a tightly closed container under inert atmosphere.

CHEMICAL FORMULA: C_7H_8O **MW:** 108.14

PHYSICAL DESCRIPTION: Colorless liquid in amber ampule **CAS #:** 100-51-6

HAZARDS: Read Safety Data Sheet before using. All chemical reference materials should be considered potentially hazardous and should be used only by qualified laboratory personnel.

INSTRUCTIONS FOR USE: Do not dry, use on the as is basis. The internal pressure of the container may be slightly different from the atmospheric pressure at the user's location. Open slowly and carefully to avoid dispersion of the material. This material is intended for Laboratory Use only. Not for drug, household or other uses.

TRACEABILITY ASSAY

Comparative assay demonstrates direct traceability to Pharmacopeial Standards

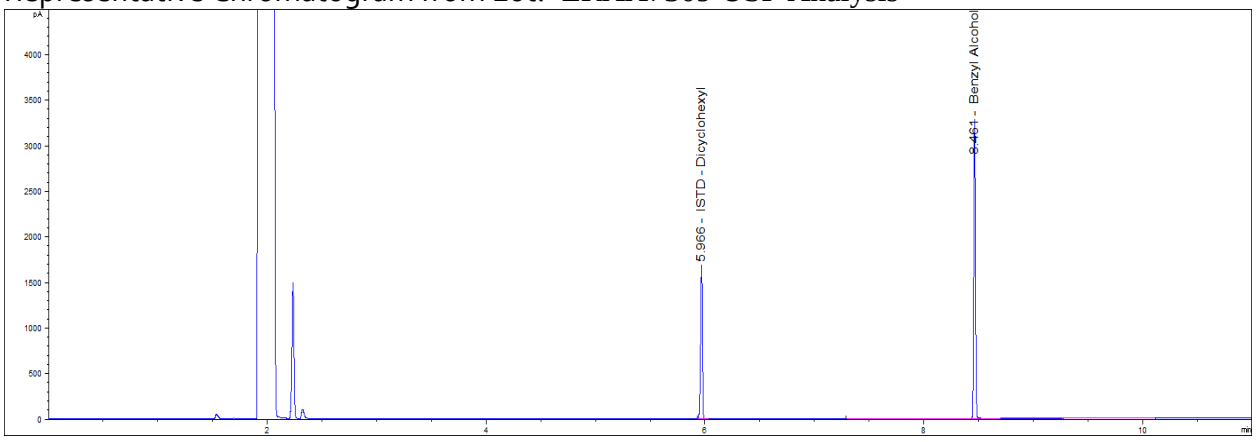
ASSAY vs. USP REFERENCE STANDARD (as is basis)

ASSAY VALUE	vs. USP LOT
98.4%	**R01940**
	Labeled Content = 1.00mg/mg

METHOD: GC (ref.: Adapted from Benzyl Alcohol, Current Compendial Monographs)

Column: SupelcoWax, 0.32 mm x 30 m, 0.5 µm
Carrier Gas: H_2
Flow: 2.0 mL/min
Temperature Program: 40°C, 20°C/min to 220°C, hold 2min
Injection: 1µL/200°C
Split Ratio: 10:1
Detector: FID/240°C
Internal Standard: Dicyclohexyl

Representative Chromatogram from Lot: LRAA7309 USP Analysis

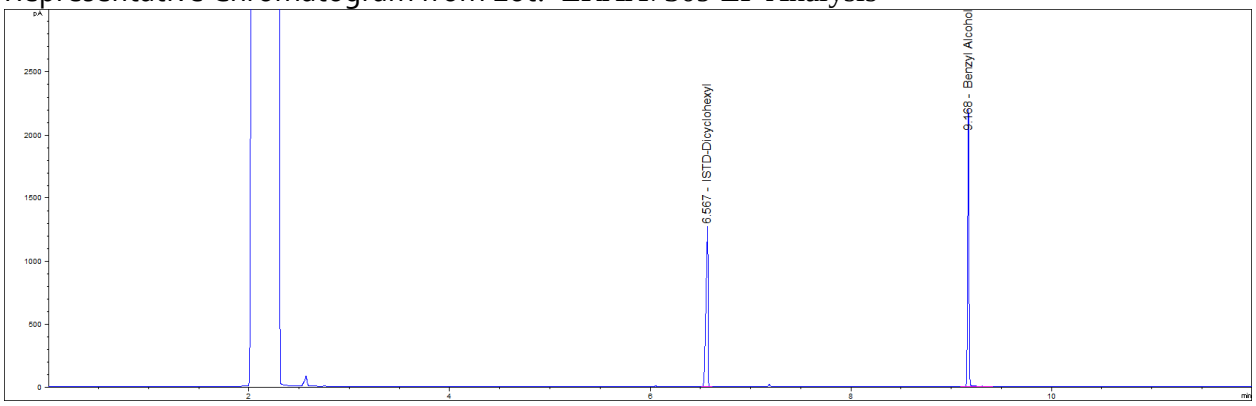


ASSAY vs. EP CRS (as is basis)

ASSAY VALUE	vs. EP BATCH
98.2%	**3.0**
	Labeled Content = 99.2%

Column: Supelcoway 10, 0.32 mm x 30 m, 0.2 µm
Carrier Gas: H_2
Flow: 1.2 mL/min
Temperature Program: 40°C, 20°C/min to 220°C, hold 2min
Injection: 1 µL/200°C
Split Ratio: 10:1
Detector: FID/240°C
Internal Standard: Dicyclohexyl

Representative Chromatogram from Lot: LRAA7309 EP Analysis



PURITY DETERMINATION BY MASS BALANCE

CHROMATOGRAPHIC IMPURITY ANALYSIS

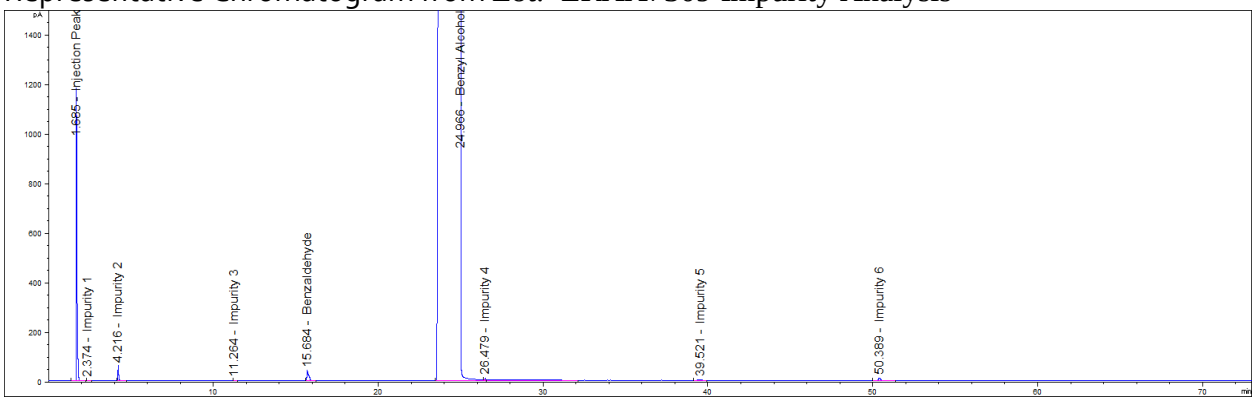
METHOD: GC (ref.: Benzyl Alcohol, Current Compendial Monographs)
Column: SupelcoWax, 0.32mm x 30m, 0.2um
Carrier Gas: H_2
Flow: 2.5 mL/min
Temperature Program: 30°C, 5°C/min to 220°C, hold 35 min
Injection: 1µL/200°C
Split Ratio: 10:1
Detector: FID/240°C

Impurities Detected:

Impurity 1:	0.0004%	Impurity 2:	0.01%
Impurity 3:	0.0004%	Benzaldehyde:	0.01%
Impurity 4:	0.0007%	Impurity 5:	0.0005%
Impurity 6:	0.004%		

Total Impurities: **0.03%**

Representative Chromatogram from Lot: LRAA7309 Impurity Analysis



WATER DETERMINATION

Method: Karl Fisher titration (ref.: Current Compendial Monographs)
Mean of three measurements, Water Content = **0.01%**

RESIDUE ANALYSIS

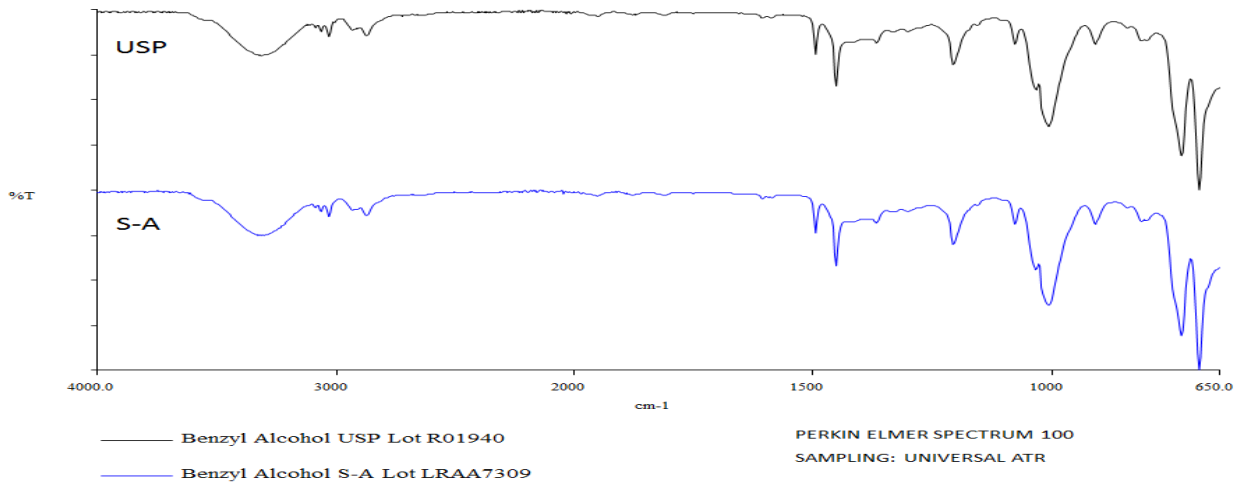
Method: Evaporation (ref.: Current Compendial Monographs)
Sample Size: ~1g
Mean of three measurements, Residue = **0.01%**

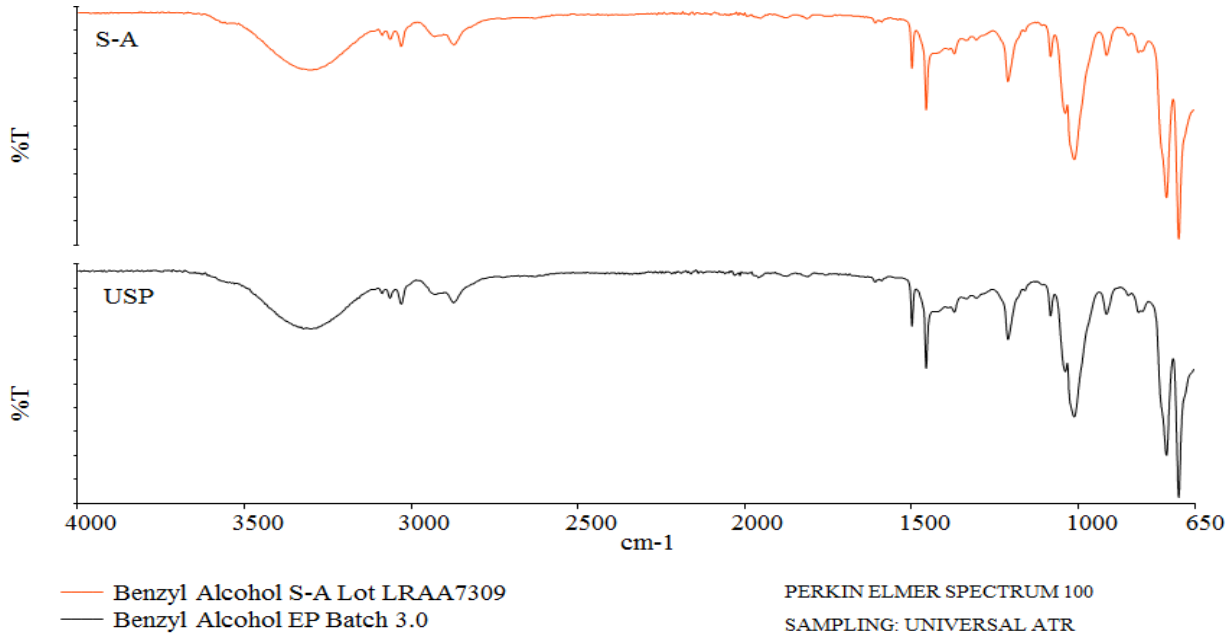
CERTIFIED PURITY BY MASS BALANCE [100% - Impurities (normalized)]

99.95% U_{crm} = ±0.04%, k = 2.04
(as is basis)

IDENTIFICATION TESTS

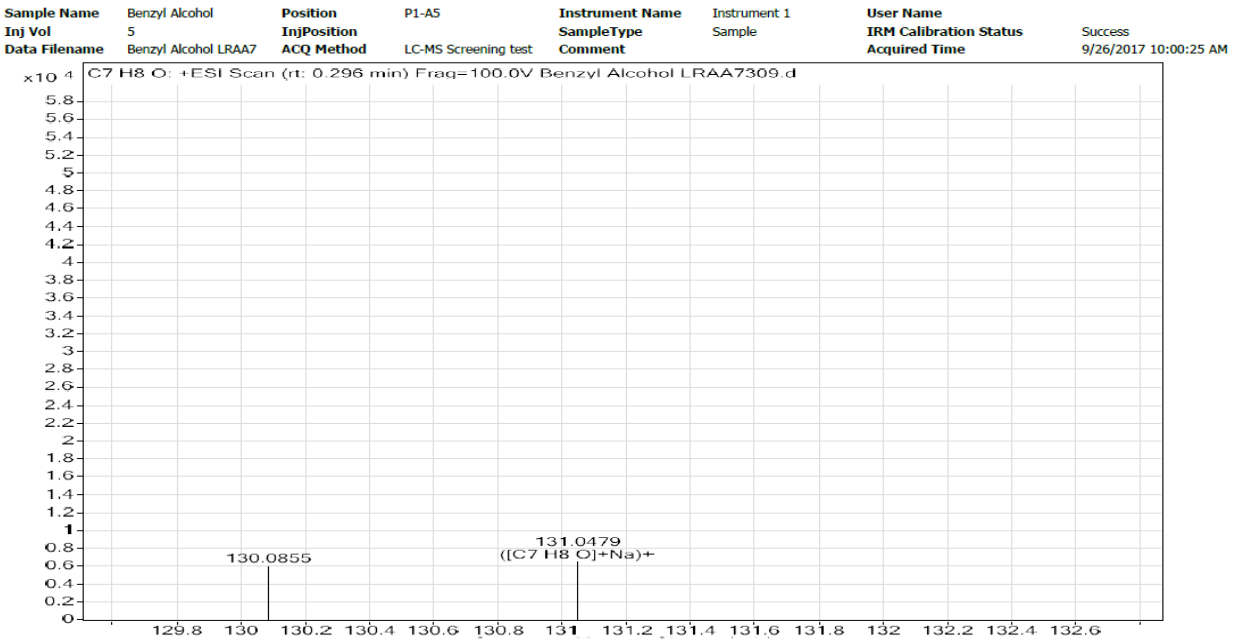
INFRARED SPECTROPHOTOMETRY (Comparative identification analysis demonstrates direct traceability to Pharmacopeial standards)





MASS SPECTRUM

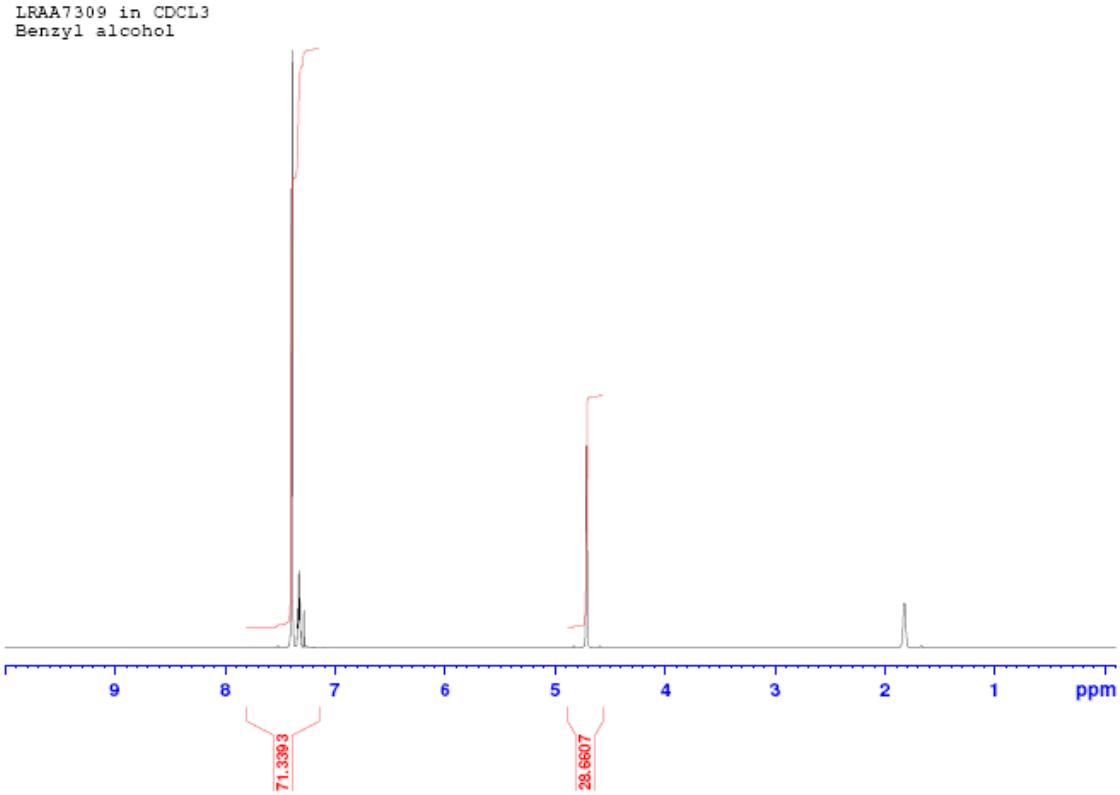
Method: HR-QTOF; 4.0 kV ESI+; temperature: 325 °C



Theoretical value: 131.0472 m/z

The signal of the MS spectrum is consistent with the theoretical value and its interpretation is consistent with the structural formula.

^{1}H NMR (Data provided by an external laboratory; not in scope of accreditation)



Consistent with structure

BOILING POINT

Specification: None (Lit.: 204.7°C)
Mettler Toledo FP900 Thermosystem with FP81 Measuring Cell
Mean of three measurements = **204.9°C *(corrected)***

REFRACTIVE INDEX

Specification: 1.538 to 1.541 (EP)
Mettler Toledo RA-510M Refractoanalyzer
Temperature: 20°C
Mean of three measurements = **1.540**

HOMOGENEITY ASSESSMENT

Homogeneity was assessed in accordance with ISO Guide 35. Completed units were sampled using a random stratified sampling protocol. The results of chemical analysis were then compared by Single Factor Analysis of Variance (ANOVA). The uncertainty due to homogeneity was derived from the ANOVA. Heterogeneity was not detected under the conditions of the ANOVA.

Analytical Method: GC Sample size: ~50 mg

UNCERTAINTY STATEMENT

Uncertainty values in this document are expressed as Expanded Uncertainty (U_{crm}) corresponding to the 95% confidence interval. U_{crm} is derived from the combined standard uncertainty multiplied by the coverage factor k, which is obtained from a *t*-distribution and degrees of freedom. The components of combined standard uncertainty include the uncertainties due to characterization, homogeneity, long term stability, and short term stability (transport). The components due to stability are generally considered to be negligible unless otherwise indicated by stability studies.

STABILITY ASSESSMENT

Significance of the stability assessment will be demonstrated if the analytical result of the study and the range of values represented by the Expanded Uncertainty do not overlap the result of the original assay and the range of its values represented by the Expanded Uncertainty. The method employed will usually be the same method used to characterize the assay value in the initial evaluation.

Long Term Stability Evaluation - An assessment, or re-test, versus a Compendial Reference Standard may be scheduled, within the 3 year anniversary date of a release of a Secondary Standard. The re-test interval will be determined on a case-by-case basis.

Short Term Stability Study - It is useful to assess stability under reasonably anticipated, short term transport conditions by simulating exposure of the product to humidity and temperature stress. This type of study is conducted under controlled conditions of elevated temperature and humidity.

QC Supervisor

QA Supervisor

APPENDIX

Original Release Date:	31 March 2015
Stability Test Date:	31 July 2016
Requalification Test Date:	31 July 2016
Requalification Test Date:	31 October 2017

Manufactured and certified by Sigma-Aldrich RTC, Inc.
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(Phone): 1-307-742-5452 (Fax): 1-855-831-9212
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ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

ANAB ACCREDITED ISO GUIDE 34 REFERENCE MATERIAL PRODUCER