



Certificate of Analysis

AR-2814

RESIDUAL OIL CRM

LOT #814822

LID ID 814822

% SULFUR = 1.08
EXPANDED UNCERTAINTY = ± 0.06
(k=2, @ 95% confidence limit, n=29)

Method used for analysis: ASTM D 4294-16, ARI-LAB-619

Reference Material(s) Used: NIST 1623b, 1619a

Alpha - AR2897-897510, AR2814-141208, AR2815-815315, AR2818-818909

The intended use of this standard is for the calibration and or verification of sulfur analysis in residual oil or similar materials by XRF or other valid testing methods. This standard was produced gravimetrically using high purity materials, with balances calibrated and checked by precision NIST traceable weights. The above ASTM test method and NMI references listed were used for testing. The uncertainty value represents the estimated expanded uncertainty using ANOVA, ISO Guide 35, and the Guide to Uncertainty Measurement. Metrological traceability is to the SI derived unit of mass fraction expressed as percent. The sample size used for testing was placed into a removable sample cup, equipped with replaceable X-ray transparent plastic film, and providing a sample depth of at least 4mm and a diameter of at least 10mm. When necessary, professional judgment is applied toward consideration of data and statistical information. The statistical analysis and the overall direction and coordination of the analytical measurements leading to certification were performed by K.E. Dyer, Chief Chemist at Alpha Resources. Normal test procedures should be employed when using this standard. This includes using the *reproducibility* and *repeatability* uncertainty for the test method you wish to employ. The material used in production of this standard was identified in accordance with ARI-LAB-603. The samples for round robin testing were selected in accordance with ARI-LAB-625. The above values relate only to the material used to produce this standard.

Before use, the contents of the bottle should be mixed gently. Any exposure to air and light should be kept to a minimum. Keep sealed and store upright under normal laboratory conditions. This bottle contains 100ml to be used as per the test method. Sample size and minimum sample size may be contingent upon your test method or instrumentation manufacturer recommendations. This reference material was produced in accordance with ISO 17034.

Remedies for any claimed defect in this product will be limited to product replacement or refund of the purchase price. In no event, shall Alpha Resources be liable for incidental or consequential damages. This certificate cannot be reproduced except in full.

This is a Certified Reference Material and is traceable to the above-mentioned standards. For good laboratory practice, it is recommended that all standards be verified as fit for purpose prior to use. These test results are accredited under the Alpha Resources LLC laboratory's ISO/IEC 17025 and ISO 17034 (RMP) accreditation issued by ANSI-ASQ/ANAB. Refer to certificate and scope of accreditation(s) AT-1200 and AR1920.

Reported values are valid for two years from the date of certification.

Certified October 5, 2022
Dustin Jenkins, Ph.D.
Global Technical Director