NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

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Standard Reference Material® 1694a
Sulfur Dioxide in Nitrogen
(Nominal Amount-of-Substance Fraction 100 µmol/mol)
Lot 95-J-XX

CERTIFICATE OF ANALYSIS

Purpose: The certified value delivered by this Standard Reference Material (SRM) is intended for use in producing metrologically traceable secondary standards for the calibration of instruments used for sulfur dioxide determinations.

Description: This SRM is a primary gas mixture supplied in a DOT 3AL-specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psig), which provides the user with 0.73 m^3 (25.8 ft^3) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-660 stainless steel valve, which is the recommended outlet for this sulfur dioxide mixture.

Certified Value: A NIST certified value is a value for which NIST has the highest confidence in that all known or suspected sources of bias and imprecision have been accounted [1]. This SRM mixture has been certified for sulfur dioxide amount-of-substance fraction (mole fraction, sometimes termed "molar concentration"). This certified value is traceable to the International System of Units (SI) through the gravimetric primary standards and procedures used in the preparation of this mixture. The certified value given below applies to all cylinders in this lot.

Sulfur Dioxide Mole Fraction: 98.57 µmol/mol ± 0.98 µmol/mol[(a)]

[(a)] The certified value is expressed as $x \pm U_{95\,\%}(x)$, where x is the value and $U_{95\,\%}(x)$ is the expanded uncertainty of the value. The true value of the analyte lies within the interval $x \pm U_{95\,\%}(x)$ with 95 % confidence. The uncertainty is expressed as an expanded uncertainty $U = ku_c$ with u_c determined by experiment and a coverage factor $k = 2$. For guidance in propagating this uncertainty, see reference 2.

Additional Information: Appendix A contains a table of all cylinder Sample Numbers and their associated information for this lot.

Period of Validity: The certified value delivered by **SRM 1694a**, **Lot No. 95-J-XX** is valid within the measurement uncertainty specified until **24 March 2033**, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see "Storage" and "Cylinder and Gas Handling Information"). The certification is nullified if the SRM is damaged, contaminated or otherwise modified, or if the internal pressure drops below 0.7 MPa (100 psig).

Maintenance of Certified Value: NIST will monitor this SRM over the period of its validity. If substantive technical changes occur that affect the certification, NIST will issue an amended certificate through the NIST SRM website (https://www.nist.gov/srm). Before making use of any of the values delivered by this material, users should verify they have the most recent version of this documentation, available through the NIST SRM website (https://www.nist.gov/srm).

Marcela Najarro, Acting Chief
Chemical Sciences Division

Steven J. Choquette, Director
Office of Reference Materials

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Safety: Consult the Safety Data Sheet (SDS) for hazard information.

Storage: This SRM should be stored under normal laboratory conditions within the temperature range of 15 °C to 30 °C.

Cylinder and Gas Handling Information: NIST recommends the use of a high purity, two stage pressure regulator with a stainless-steel diaphragm and CGA-660 outlet to safely reduce the pressure and to deliver this mixture to the instrument. The regulator should be purged to prevent accidental contamination of the SRM by repeatedly (minimum three times) opening the valve and pressurizing the regulator, then closing the valve and releasing the pressure safely into a vent line.

Mixture Preparation: The gas mixtures comprising this SRM lot were prepared in accordance with NIST technical specifications by a commercial specialty gas vendor under contract to NIST. The specifications stipulate that each SRM mixture be identical in sulfur dioxide mole fraction and stable with time.

Analytical Method: Analyses of the sulfur dioxide mole fraction for this lot of cylinders were conducted by comparison to a representative cylinder chosen from the lot, designated as the SRM lot standard (LS). The LS was compared to NIST primary gravimetric standards using pulsed fluorescence spectroscopy. Each of the sulfur dioxide mixtures that comprise this SRM lot was then compared to the LS using primary gravimetric standards using pulsed fluorescence. Within the precision of the NIST measurements, all the cylinders comprising this SRM lot have identical sulfur dioxide mole fractions.

CAS Registry Numbers: This SRM is certified for sulfur dioxide in nitrogen. The relevant CAS Registry numbers for these components are: sulfur dioxide CAS Registry 7446-09-5; nitrogen (balance gas) CAS Registry 7727-37-9.

NOTICE TO USERS

NIST strives to maintain the SRM inventory supply, but NIST cannot guarantee the continued or continuous supply of any specific SRM. Accordingly, NIST encourages the use of this SRM as a primary benchmark for the quality and accuracy of the user's in house reference materials and working standards. As such, the SRM should be used to validate the more routinely used reference materials in a laboratory. Comparisons between the SRM and in house reference materials or working measurement standards should take place at intervals appropriate to the conservation of the SRM and the stability of relevant in house materials. For further guidance on how this approach can be implemented, contact NIST by email at srms@nist.gov.

REFERENCES

[1] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Molloy, J.; Nelson, M.A.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sander, L.C.; Schiel, J.E.; Sharpless, K.E.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Material Measurement Laboratory*; NIST Special Publication (NIST SP) 260-136, 2021 edition; U.S. Government Printing Office: Washington, DC (2021); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2021.pdf (accessed Feb 2026).

[2] Possolo, A.M; *Evaluating, Expressing, and Propagating Measurement Uncertainty for NIST Reference Materials*; NIST Special Publication (NIST SP) 260-202; U.S. Government Printing Office: Washington, DC (2020); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-202.pdf (accessed Feb 2026).

If you use this SRM in published work, please reference:

Cecelski C, Harris K, Goodman C, Kimes W, Liu Q, Miller W, Carney J (2021) Certification of NIST Gas Mixture Standard Reference Materials. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) 260-222. https://doi.org/10.6028/NIST.SP.260-222

Certificate Revision History: 23 February 2026 (Change of period of validity; editorial changes); **19 April 2022** (Change of period of validity; updated format; editorial changes); **11 December 2018** (Updated certified value and uncertainty; change of expiration date; editorial changes); **06 April 2015** (Change of expiration date; editorial changes); **01 October 2008** (Original certification date).

Certain commercial equipment, instruments, or materials may be identified in this Certificate of Analysis to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, MD 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at https://www.nist.gov/srm.

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APPENDIX A

The tables contain all cylinder Sample Numbers and their associated information for this lot.

Sample Number	Cylinder Number	Hydrotest Date	Blend Date
95-J-05	CAL016711	November 2005	May 2006
95-J-06	CAL016676	November 2005	May 2006
95-J-07	CAL016655	November 2005	May 2006
95-J-08	CAL016702	November 2005	May 2006
95-J-09	CAL016636	November 2005	May 2006
95-J-10	CAL016717	November 2005	May 2006
95-J-11	CAL016660	November 2005	May 2006
95-J-12	CAL016740	November 2005	May 2006
95-J-13	CAL016653	November 2005	May 2006
95-J-14	CAL016735	November 2005	May 2006
95-J-15	CAL016739	November 2005	May 2006
95-J-16	CAL016705	November 2005	May 2006
95-J-17	CAL016657	November 2005	May 2006
95-J-18	CAL016715	November 2005	May 2006
95-J-19	CAL016682	November 2005	May 2006
95-J-20	CAL016633	November 2005	May 2006
95-J-21	CAL016677	November 2005	May 2006
95-J-22	CAL016721	November 2005	May 2006
95-J-23	CAL016709	November 2005	May 2006
95-J-24	CAL016678	November 2005	May 2006
95-J-25	CAL016662	November 2005	May 2006
95-J-26	CAL016654	November 2005	May 2006
95-J-27	CAL016724	November 2005	May 2006
95-J-28	CAL016639	November 2005	May 2006
95-J-29	CAL016716	November 2005	May 2006
95-J-30	CAL016656	November 2005	May 2006
95-J-31	CAL016644	November 2005	May 2006
95-J-32	CAL016659	November 2005	May 2006
95-J-33	CAL016688	November 2005	May 2006
95-J-35	CAL016669	November 2005	May 2006
95-J-36	CAL016635	November 2005	May 2006
95-J-38	CAL016731	November 2005	May 2006
95-J-39	CAL016720	November 2005	May 2006
95-J-40	CAL016664	November 2005	May 2006
95-J-41	CAL016698	November 2005	May 2006
95-J-42	CAL016675	November 2005	May 2006
95-J-43	CAL016648	November 2005	May 2006
95-J-44	CAL016746	November 2005	May 2006
95-J-45	CAL016681	November 2005	May 2006
95-J-46	CAL016714	November 2005	May 2006
95-J-47	CAL016640	November 2005	May 2006
95-J-48	CAL016694	November 2005	May 2006
95-J-49	CAL016710	November 2005	May 2006
95-J-50	CAL016697	November 2005	May 2006
95-J-51	CAL016745	November 2005	May 2006
95-J-52	CAL016663	November 2005	May 2006
95-J-54	CAL016651	November 2005	May 2006
95-J-55	CAL016650	November 2005	May 2006
95-J-56	CAL016685	November 2005	May 2006
95-J-57	CAL016632	November 2005	May 2006
95-J-58	CAL016728	November 2005	May 2006

The tables contain all cylinder Sample Numbers and their associated information for this lot.

Sample Number	Cylinder Number	Hydrotest Date	Blend Date
95-J-59	CAL016627	November 2005	May 2006
95-J-60	CAL016625	November 2005	May 2006
95-J-61	CAL016638	November 2005	May 2006
95-J-62	CAL016733	November 2005	May 2006
95-J-63	CAL016666	November 2005	May 2006
95-J-64	CAL016700	November 2005	May 2006
95-J-65	CAL016671	November 2005	May 2006
95-J-67	CAL016723	November 2005	May 2006
95-J-68	CAL016701	November 2005	May 2006
95-J-69	CAL016641	November 2005	May 2006
95-J-70	CAL016622	November 2005	May 2006
95-J-71	CAL016642	November 2005	May 2006
95-J-72	CAL016668	November 2005	May 2006
95-J-73	CAL016737	November 2005	May 2006
95-J-74	CAL016624	November 2005	May 2006
95-J-75	CAL016683	November 2005	May 2006
95-J-76	CAL016707	November 2005	May 2006
95-J-77	CAL016689	November 2005	May 2006
95-J-78	CAL016621	November 2005	May 2006
95-J-79	CAL016665	November 2005	May 2006
95-J-80	CAL016637	November 2005	May 2006
95-J-81	CAL016699	November 2005	May 2006
95-J-82	CAL016634	November 2005	May 2006
95-J-84	CAL016713	November 2005	May 2006
95-J-87	CAL016725	November 2005	May 2006
95-J-88	CAL016706	November 2005	May 2006
95-J-89	CAL016741	November 2005	May 2006
95-J-90	CAL016649	November 2005	May 2006
95-J-91	CAL016646	November 2005	May 2006
95-J-92	CAL016722	November 2005	May 2006
95-J-93	CAL016658	November 2005	May 2006
95-J-95	CAL016718	November 2005	May 2006
95-J-96	CAL016691	November 2005	May 2006
95-J-98	CAL016647	November 2005	May 2006
95-J-99	CAL016628	November 2005	May 2006
95-J-100	CAL016692	November 2005	May 2006
95-J-102	CAL016673	November 2005	May 2006
95-J-103	CAL016652	November 2005	May 2006
95-J-104	CAL016686	November 2005	May 2006
95-J-105	CAL016734	November 2005	May 2006
95-J-106	CAL016631	November 2005	May 2006
95-J-107	CAL016645	November 2005	May 2006
95-J-108	CAL016661	November 2005	May 2006
95-J-109	CAL016679	November 2005	May 2006
95-J-110	CAL016643	November 2005	May 2006
95-J-112	CAL016736	November 2005	May 2006
95-J-114	CAL016680	November 2005	May 2006
95-J-115	CAL016738	November 2005	May 2006
95-J-116	CAL016626	November 2005	May 2006

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