National Institute of Standards & Technology

# Certificate of Analysis

## Standard Reference Material 3142a

### Spectrometric Standard Solution

### Praseodymium

### Batch Code 491108

This Standard Reference Material (SRM) is intended for use in atomic absorption spectrometry, inductively-coupled plasma optical spectrometry, spectrophotometry, or any other analytical technique that requires aqueous standard solutions for calibrating instruments. SRM 3142a is a single element solution prepared gravimetrically to contain 10 mg/mL of praseodymium with a nitric acid concentration (V/V) of 10 percent. The certified value (V) is based on replicate titrations against a reference solution of praseodymium metal of known purity. The value has been adjusted upward by 0.1% relative, based on estimated transpiration losses of solvent through the container walls of 0.2% relative per year after the bottle is removed from the plastic sleeve. The density of the solution at 22 °C is 1.0975 g/mL.

| Metal | Concentration (mg/mL) | Source Purity, % | Acid Conc. (V/V) Approximate |
|---|---|---|---|
| Pr | 9.97 ± 0.02 | $Pr_6O_{11}$ (99.99%)[a] | $HNO_3$, 10% |

[a]This high-purity material was analyzed by optical emission spectrometry and atomic absorption spectrometry and found to contain less than 100 μg/g total impurities.

The uncertainty in the certified value is calculated as

$$U = (2u_c + 0.001V) \text{ mg/mL}$$

where $u_c$ is the "combined uncertainty" calculated according to the CIPM approach [1]. The value of $u_c$ is intended to represent, at the level of one standard deviation, the combined effect of uncertainty components associated with volumetric, gravimetric, and titrimetric factors, as well as the purity of the praseodymium metal. The additional quantity, 0.001V, is an allowance for transpiration of the solution through the container walls, which is estimated to be ± 0.1% of the certified value during the one-year period of validity of the certification.

SRM 3142a was prepared by T.A. Butler; atomic emission spectrometric and titrimetric analyses were made by T.A. Butler and C.M. Beck II of the NIST Inorganic Analytical Research Division.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Gaithersburg, MD 20899
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Thomas E. Gills, Chief
Standard Reference Materials Program

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## Procedures for Use

**Stability:** This certification is valid for one year from the shipping date provided the solutions are kept tightly capped and stored under normal laboratory conditions. NIST will monitor the stability of representative solutions from the SRM lot and if changes occur that invalidate this certification, NIST will notify purchasers.

**Preparation of Working Standard Solutions:** All solutions should be brought to 22 $\pm$ 1 °C before use. All glass or plastic surfaces coming into contact with the standard must have been previously cleaned. A working standard solution can be prepared from the SRM solution by serial dilution. Dilutions should be made with certified volumetric class A flasks and 5 or 10 mL class A pipets. All volumetric transfers of solutions should be performed using a proven analytical technique. Each dilution should be acidified with an appropriate high-purity acid and diluted to calibrated volume using high-purity water. The stability of the working standard solution will depend on the final acid concentration; therefore, care should be exercised to ensure that the final acid concentration of the dilution closely approximates that of the SRM. To achieve the highest accuracy, the analyst should prepare daily working solutions from 100 $\mu$g/mL dilutions of the original SRM solution.

REFERENCE

[1] *"Guide to the Expression of Uncertainty in Measurement"*, ISBN 92-67-10188-9, 1st Ed. ISO, Switzerland, 1993.