

**Agilent Product Name:** Thulium Standard: 1000 µg/mL Tm in 5% HNO<sub>3</sub>

**Agilent Part No:** 5190-8541

**Lot No:** 000985706N

### Product Specifications

Analyte	Starting Material	CAS #	Matrix	Certified Concentration
Tm	Tm <sub>2</sub> O <sub>3</sub>	12036-44-1	5% HNO <sub>3</sub>	999 ± 3 µg/mL (w/v)
				989 ± 3 µg/g (w/w)

**Intended Use:** This solution is intended for use as a certified reference material or calibration standard for inductively coupled plasma optical emission spectroscopy (ICP-OES), inductively coupled plasma mass spectrometry (ICP-MS), atomic absorption spectroscopy (flame AAS or GFAAS), microwave plasma atomic emission spectroscopy (MP-AES), x-ray fluorescence spectroscopy (XRF), and other techniques for elemental analysis.

**Certification & Traceability:** This CRM was manufactured under a quality management system that is accredited to **ISO Guide 34, ISO/IEC 17025**, and registered to **ISO 9001**. This CRM was prepared to a nominal concentration of 1000 µg/mL by gravimetric methods using 99.99% pure thulium oxide (Tm<sub>2</sub>O<sub>3</sub>) dissolved in high purity nitric acid (HNO<sub>3</sub>) and diluted with ASTM Type I Water. The balances used in the preparation of this CRM are calibrated regularly with traceability to NIST. All volumetric dilutions are performed in Class A calibrated glassware. The certified concentration and uncertainty were determined using the "High Performance ICP-OES" protocol developed by NIST and both the certified concentration and uncertainty values are traceable to NIST SRM 3160a lot #790912. The uncertainty associated with the certified concentration represents the expanded uncertainty at the 95% confidence level using a coverage factor of k=2.

**Uncertified Values:** Agilent ICP-MS was used to determine trace metal concentrations for this product (nd = not determined).

#### Trace Concentrations (µg/L)

Ag	<0.5	Ce	<0.2	Gd	0.4	Lu	20.9	Pb	8	Se	<2	Tl	<0.5
Al	8	Co	<1	Ge	<0.5	Mg	<5	Pd	<0.5	Si	<100	Tm	Major
As	<2	Cs	<0.5	Hf	<0.2	Mn	<1	Pr	<0.2	Sm	0.6	U	<0.5
Au	<0.5	Cr	<1	Hg	<0.5	Mo	<0.5	Pt	<0.5	Sn	<0.5	V	<1
B	<5	Cu	<1	Ho	1.24	Na	<20	Rb	<0.5	Sr	<1	W	<0.5
Ba	<1	Dy	<0.2	In	nd	Nb	<0.5	Re	<2	Ta	<0.5	Y	1.1
Be	<0.5	Er	0.9	Ir	<0.2	Nd	<0.2	Rh	<0.5	Tb	<0.5	Yb	128
Bi	<0.2	Eu	<0.2	K	<20	Ni	<2	Ru	<0.5	Te	<1	Zn	9
Ca	<20	Fe	40	La	<0.5	Os	<0.5	Sb	<0.5	Th	0.6	Zr	<0.5
Cd	<0.5	Ga	<0.5	Li	<2	P	<100	Sc	<5	Ti	<2		

**Instructions for Use:** Agilent Technologies recommends that the solution be thoroughly mixed by repeated shaking or swirling of the bottle immediately prior to use. To achieve the highest accuracy the analyst should: (1) use only pre-cleaned containers and transferware, (2) avoid pipetting directly from the CRM's original container, (3) use a minimum sub-sample size of 500 µL, (4) make dilutions using calibrated balances or certified volumetric class A flasks and pipettes, (5) dilute to volume using the same matrix as the original CRM, and (6) never pour used product back into the original container. The solution should be kept tightly capped. Store at controlled room temperature per USP 35 (10.30.60). Do not freeze, heat, or expose to direct sunlight. Minimize exposure to moisture or high humidity.

**Period of Validity:** Agilent Technologies ensures the accuracy of this solution until the expiration date shown below, provided the instructions for use are followed. During the period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution.

Sample lot approver:



QA Manager

Date of release: 26 March 2015

Date of expiration: 01 October 2017