

CERTIFICATE**Aqueous calibration solution****ASTASOL® AN9088MN**

This Certificate is designed in accordance with ISO Guide 31

Category: Certified reference material**Analytes:** Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sc, Sm, Tb, Tm, Y, Yb**Product code:** AN9088MN**Starting primary compounds and theirs purities (%):**

Ce(NO₃)₃ · 6H₂O 99.99; Dy₂O₃ 99.99; Er₂O₃ 99.99; Eu₂O₃ 99.996; Gd₂O₃ 99.999;
 Ho₂O₃ 99.99; La₂O₃ 99.999; Lu₂O₃ 99.995; Nd₂O₃ 99.997; Pr₆O₁₁ 99.996; Sc₂O₃ 99.99;
 Sm₂O₃ 99.99; Tb₄O₇ 99.998; Tm₂O₃ 99.995; Y₂O₃ 99.99; Yb₂O₃ 99.998

Matrix:5% HNO₃ (v/v), prepared from sub boil distilled HNO₃ (ANALPURE®) and ultrapure demineralized water (resistivity ≥ 18 MΩ.cm, 0.22μm filtered).**Density and its expanded uncertainty (k = 2):** 1.0276 ± 0.0005 g/cm³ (at 20 °C)**Certified value of concentration and its expanded uncertainty (k = 2) at 20 °C**

Ce, La, Nd, Pr	100.0 ± 0.2 mg/l	97,3 ± 0.3 mg/kg*
Dy, Er, Eu, Gd, Ho, Lu	20.00 ± 0.04 mg/l	19.46 ± 0.06 mg/kg*
Sc, Sm, Tb, Tm, Y, Yb	20.00 ± 0.04 mg/l	19.46 ± 0.06 mg/kg*

*Mass fraction in mg/kg is derived from density

Specification:**Batch No.:** 0007**The date of production:** 18.08.2023**Shelf life:** 3 years from the date of production**The date of first opening of the aluminium bag:****Expiry date:**.....12 months from the first opening of the aluminium bag within shelf life period, which should be indicated on the label of the bottle as well.

Intended use:

For calibration and validation of analytical methods analysing aqueous solutions such as atomic spectrometry (AAS, AES, ICP-OES, ICP-MS), molecular absorption spectrometry and selected electroanalytical methods.

Certification and traceability:

This CRM is certified on the basis of gravimetric preparation. This procedure also ensures a direct traceability to SI unit – kg. Certified values, uncertainties and traceability were further verified by primary analytical methods (gravimetric, titrimetric) as well as by instrumental methods (AAS, AES, ICP-OES) calibrated with independent reference solutions (e.g. SRM NIST, in-house solid and liquid CRMs). Analytical methods and references used are listed in the following table.

Analyte	Methods	References
Ce	Complexometric titration with EDTA	SRM NIST 928, SRM NIST 3110
Dy	Complexometric titration with EDTA	SRM NIST 928
Er,	Complexometric titration with EDTA	SRM NIST 928
Eu	Complexometric titration with EDTA	SRM NIST 928
Gd	Complexometric titration with EDTA	SRM NIST 928
Ho	Complexometric titration with EDTA	SRM NIST 928, SRM NIST 3123a
La	Complexometric titration with EDTA	SRM NIST 928, SRM NIST 3127a
Lu	Complexometric titration with EDTA	SRM NIST 928
Nd	Complexometric titration with EDTA	SRM NIST 928
Pr	Complexometric titration with EDTA	SRM NIST 928
Sc	Complexometric titration with EDTA	SRM NIST 928, SRM NIST 3148a
Sm	Complexometric titration with EDTA	SRM NIST 928
Tb	Complexometric titration with EDTA	SRM NIST 928, SRM NIST 3157a
Tm	Complexometric titration with EDTA	SRM NIST 928
Y	Complexometric titration with EDTA	SRM NIST 928, SRM NIST 3167a
Yb	Complexometric titration with EDTA	SRM NIST 928

Homogeneity and stability:

It has been demonstrated that this CRM is homogeneous and its stability is guaranteed during the whole shelf life provided the solution it kept under conditions presented below.

Trace impurities in bottled solution (in mg/l):

Determination of trace impurities was performed by AAS, ICP-OES and ICP-MS. Impurity levels are supplied only for information of the user and should not be used as calibration data.

Li	Be											B	C	N	O	F
<0,01	<0,002											<0,1	N.A	M	M	N.A
Na	Mg											Al	Si	P	S	Cl
<0,05	<0,005											<0,01	<0,1	<0,1	<0,5	N.A
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br
<0,02	<0,05	A	<0,01	<0,01	<0,01	<0,005	<0,01	<0,02	<0,02	<0,01	<0,02	<0,1	<0,02	<0,01	<0,1	N.A
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I
<0,05	<0,01	A	<0,01	<0,05	<0,02	N.A	<0,05	<0,1	<0,02	<0,01	<0,004	<0,05	<0,01	<0,01	<0,1	N.A
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi		
<0,05	<0,01	A	<0,1	<0,05	<0,05	<0,02	<0,1	<0,1	<0,02	<0,02	<0,001	<0,1	<0,01	<0,01		
Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu				
A	A	A	A	A	A	A	A	A	A	A	A	A				
Th	U															
<0,1	<0,1															

M = matrix

N.A = not analysed

< x = below detection limit

A = analyte

Storing and instruction for use:

This CRM must be stored in the original closed bottle between 5 – 30 °C. The producer guarantees a declared shelf life and expiration time provided the CRM is properly stored and professionally handled. The temperature of the solution must be 20 ± 0.5 °C before every use. It is necessary to indicate on this certificate and the label the expiration time, which depends on the date of the first time the aluminium bag was opened. After use, the bottle must be immediately tightly capped, and it is recommended to put it back into the reclosable aluminium bag. It is not recommended to use the standard solution when the bottle contains less than 10 % of the solution. Therefore, in case of non-transparent bottle, it is important to indicate the amount of the solution used, e.g. on the label. Do not pipette from the bottle. Do not return removed aliquots to bottle.

Note:

Detailed information about the production, homogeneity, stability, coding, characterization and storing of this CRM are described in the document “Detailed information about the production of aqueous calibration solutions ASTASOL®“ which is available for download on the website www.analytika.net.

Producer:


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Quality management systems of company ANALYTIKA®, spol. s r.o.:

ČSN EN ISO 9001:2016
ČSN EN ISO/IEC 17025:2018
ČSN EN ISO 17034:2017

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