

## Certificate of Analysis

Date of Testing: 2022-03-24 09:05:01  
 Date of Next Testing: 2023-03-24 09:05:01  
 Product Name: **Ammonium hydroxide solution**  
 CAS Number: 1336-21-6  
 Specifications & Purity: 28% in H<sub>2</sub>O, ≥99.999% metals basis  
 Lot #: C2219214  
 SKU #: **A112085**  
**Analysis: 054800**

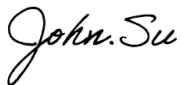
Parameter	Limit Values	Result
(NO <sub>2</sub> )Nitrate	0-0.1 (ppm)	0.00 ppm
Silver (Ag)	0-0.01 (ppb)	0.01 ppb
Fluoride (F <sup>-</sup> )	0-0.1 (ppm)	0.00 ppm
Calcium(Ca)	0-0.5 (ppm)	0.48 ppm
Titanium(Ti)	0-0.05 (ppb)	0.04 ppb
Beryllium(Be)	0-0.01 (ppb)	0.01 ppb
Europium(Eu)	0-0.01 (ppb)	0.01 ppb
Cerium(Ce)	0-0.01 (ppb)	0.00 ppb
Manganese(Mn)	0-0.1 (ppb)	0.04 ppb
Cadmium(Cd)	0-0.01 (ppb)	0.01 ppb
Cesium (Cs)	0-0.01 (ppb)	0.00 ppb
Cobalt(Co)	0-0.01 (ppb)	0.01 ppb
Sulfate(SO <sub>4</sub> <sup>2-</sup> )	0-0.1 (ppm)	0.00 ppm
Mercury(Hg)	0-0.5 (ppb)	0.23 ppb
Terbium(Tb)	0-0.01 (ppb)	0.01 ppb
Molybdenum(Mo)	0-0.05 (ppb)	0.04 ppb
Holmium(Ho)	0-0.01 (ppb)	0.00 ppb
Iridium(Ir)	0-0.01 (ppb)	0.01 ppb
Lithium(Li)	0-0.01 (ppb)	0.01 ppb
Niobium(Nb)	0-0.01 (ppb)	0.01 ppb
Potassium(K)	0-1 (ppb)	0.00 ppb
(Pb)Lead	0-0.02 (ppb)	0.01 ppb
Vanadium(V)	0-0.05 (ppb)	0.05 ppb
Sb	0-0.1 (ppb)	0.00 ppb
(As)Arsenic	0-0.5 (ppb)	0.50 ppb
uranium(U)	0-0.01 (ppb)	0.01 ppb
Samarium(Sm)	0-0.01 (ppb)	0.00 ppb

Parameter	Limit Values	Result
Copper(Cu)	0-0.5 (ppb)	0.36 ppb
Yttrium(Y)	0-0.01 (ppb)	0.01 ppb
Aurum(Au)	0-0.01 (ppb)	0.00 ppb
Dysprosium(Dy)	0-0.01 (ppb)	0.00 ppb
Platinum(Pt)	0-0.01 (ppb)	0.01 ppb
Hafnium(Hf)	0-0.01 (ppb)	0.01 ppb
(Br)Bromide	0-0.05 (ppm)	0.05 ppm
Ammonia (NH3)	28-30 (%)	29.99 %
Barium(Ba)	0-0.01 (ppb)	0.00 ppb
Gadolinium (Gd)	0-0.01 (ppb)	0.01 ppb
Chromium(Cr)	0-0.05 (ppb)	0.05 ppb
Concentration	28-100 (mg/L)	99.98 mg/L
Chloride (Cl-)	0-0.5 (ppm)	0.32 ppm
Bismuth(Bi)	0-0.01 (ppb)	0.01 ppb
Palladium(Pd)	0-0.01 (ppb)	0.01 ppb
Purity	99.999-100 (%)	100.00 %
Indium (In)	0-0.01 (ppb)	0.00 ppb
Total Metallic Impuritie	0-20 (ppm)	15.70 ppm
Re	0-0.01 (ppb)	0.01 ppb
Stannum(Sn)	0-0.1 (ppb)	0.00 ppb
Germanium (Ge)	0-0.05 (ppb)	0.02 ppb
Erbium(Er)	0-0.01 (ppb)	0.01 ppb
Iodide (I-)	0-0.05 (ppm)	0.05 ppm
Yb	0-0.01 (ppb)	0.01 ppb
Iron(Fe)	0-0.5 (ppb)	0.32 ppb
Tungsten(W)	0-0.01 (ppb)	0.00 ppb
Zirconium(Zr)	0-0.01 (ppb)	0.01 ppb
Aluminum(Al)	0-0.2 (ppb)	0.20 ppb
Lanthanum(La)	0-0.01 (ppb)	0.01 ppb
carbonate (CO2)	0-10 (ppm)	9.99 ppm
Rb	0-0.01 (ppb)	0.00 ppb
Nickel(Ni)	0-0.1 (ppb)	0.01 ppb
Ruthenium (Ru)	0-0.01 (ppb)	0.01 ppb
(NO3)Nitrate	0-0.5 (ppm)	0.50 ppm
Gallium(Ga)	0-0.01 (ppb)	0.00 ppb
Magnesium(Mg)	0-0.1 (ppb)	0.00 ppb
Te	0-0.01 (ppb)	0.01 ppb
Phospate(PO4)	0-0.05 (ppm)	0.04 ppm
Sodium(Na)	0-1 (ppb)	1.00 ppb

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Parameter	Limit Values	Result
Zinc(Zn)	0-0.5 (ppb)	0.13 ppb
Th	0-0.01 (ppb)	0.01 ppb
Lu	0-0.01 (ppb)	0.00 ppb
Praseodymium(Pr)	0-0.01 (ppb)	0.01 ppb
Rhodium (Rh)	0-0.01 (ppb)	0.01 ppb
Strontium(Sr)	0-0.01 (ppb)	0.00 ppb
Appearance (A112085)	Colorless Liquid	Colorless liquid
X-Ray Diffraction	Conforms to Structure	Conforms to Structure

A handwritten signature in black ink that reads "John Su".

John Su  
QA & QC Manager