



Coated Silver®

# CERTIFICATE OF ANALYSIS

<b>Supplier:</b>	Noble Elements LLC, 1621 Central Ave., Cheyenne, WY, 82001	
<b>Country of Origin:</b>	United States of America	
<b>Product Specification</b>	Silver content (ICAP)	2.0 ± 0.2 wt%
	Average particles size (from FESEM histogram)	10 ± 2 nm
	$\lambda_{\max}$ Range (from UV-Vis Spectrophotometry)	400-404 nm
<b>CAS#:</b>	7440-22-4	
<b>Sample Description:</b>	Stable aqueous dispersion of silver nanoparticles coated with natural resin.	
<b>Sample Appearance:</b>	Odorless, dark brown liquid	
<b>Manufacture Date:</b>	07/23/2026	

## \*Sample analysis

Silver content (ICAP)	2.00 wt%
Average particles size (FESEM histogram)	10.0 nm
$\lambda_{\max}$ (UV-Vis Spectrophotometry)	401 nm

\*See analytical techniques below



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## Analytical Techniques Required for a Comprehensive Evaluation of any Colloidal Ag Nanodispersions

- 1. UV-Vis Spectrometry:** Substantiates the presence of colloidal Ag nanoparticles in the dispersion. The plot provides essential information regarding the average size of particles, their uniformity, and the degree of dispersion. *(Any colloidal Ag dispersion must be accompanied by a good quality UV-Viz spectrum.)*
- 2. Field Emission Scanning Electron Microscopy (FESEM):** Generates direct images of a very large collection of particles. It is the gold standard for giving **representative** data for the colloidal dispersion in terms of particle size and uniformity.
- 3. Transmission Electronic Microscopy Analysis (TEM).** Although often used, TEM is not capable to capture a large, **representative** number of particles in the case of very dilute dispersions (less than 500 ppm) without concentrating the dispersion and eventually aggregating the particles.
- 4. Inductively Coupled Atomic Plasma (ICAP)** Compositional analysis for inorganic/heavy metal elements.



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## Typical product data

(Based on statistical analysis)

<b>Silver nature</b>	True colloidal Metallic Silver Ionic Silver	100% trace
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**Silver Nanoparticles not Clumped** Testified by the narrow plasmon band and the lack of background UV-Viz absorption above 550 nm.

<b>Silver of particles</b>	Average particles size from FESEM image (histogram)	$10 \pm 2$ nm
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### \*Contaminants:

Heavy Metals:	Absent (less than 1.0 ppm)
Other inorganic impurities:	Absent

\*Analysis by ICAP (Inductively Coupled Atomic Plasma) – resolution 50 ppb.

**Microbiological contaminants:** Absent



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## SUPPORTING DATA

### Competition Analysis

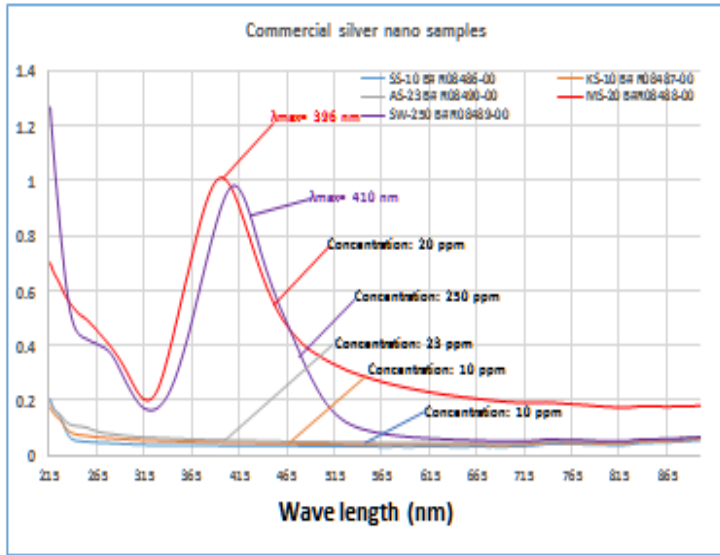
Three (3) competitor samples contain only ionic silver (no plasmon band above 300 nm detected, thus no silver particles present). Two other 2 competitor samples contain large and nonuniform particles as testified by both UV-Vis analyses (Figure 1, red plot) and TEM (Fig. 2, left and center images).

In contrast Ag-A contains small, highly uniform, 10 nm particles as shown by both TEM (Fig. 2, right image) and FESEM (Fig. 4) analyses. The particles are also not clumped as substantiated<sup>d</sup> by the narrow plasmon band in the UV-Vis and the absence of absorption above 550 nm (Fig.3, black plot).



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UV-VIS OF COMMERCIAL SILVER NANO SAMPLES

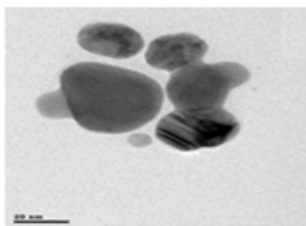


SS-10, KS-10 and AS-25 have silver ions ONLY. No Particles are present.  
 MS-20 and SW-250 have silver particles of 1-100nm size.  
 Mod MS-20 has aggregates and clumps as evidenced by the mixed base.  
 Purple SW-250 has bigger particles and aggregates too.

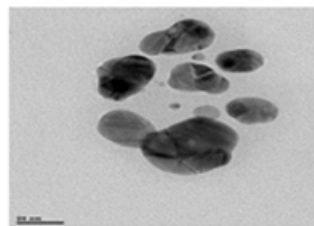


Figure 1.

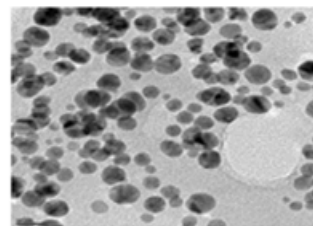
TEM Analysis



MS-20



SW-250



AG-A

Figure 2.



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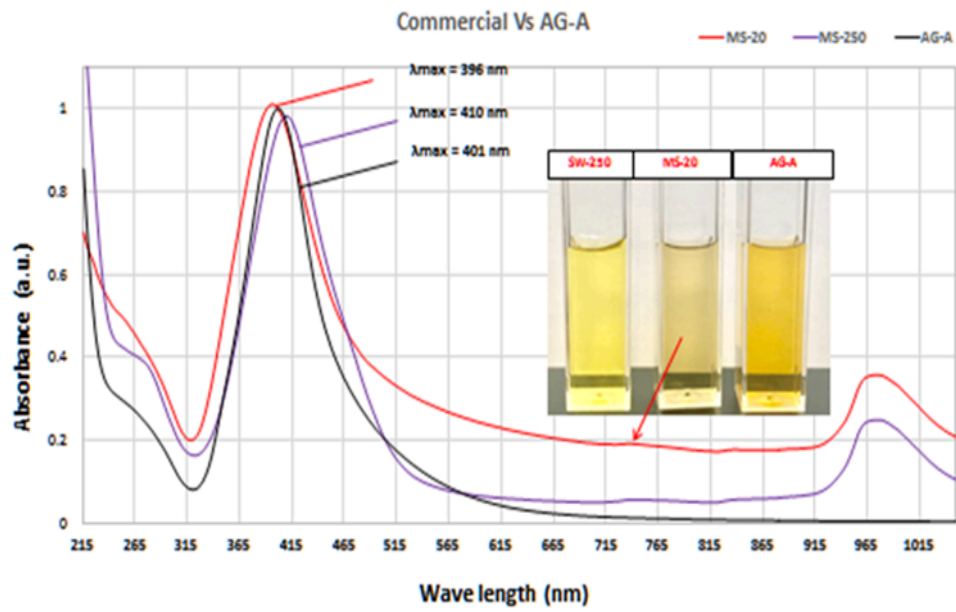


Figure 3.



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Ag-A Field Emission Electronic Microscopy  
The ONLY realistic visualization of nanoparticles  
Uniform 10 nm particles are seen

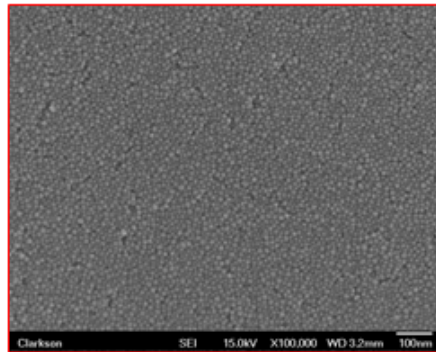


Figure 4.

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