UNDECAGOLD

Nanoprobes

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PRODUCT INFORMATION SHEET

UNDECAGOLD PARTICLES: NON-REACTIVE (UG)

Product Name:	UNDECAGOLD (UG)
Catalog Number:	2060
Appearance:	Yellow-orange powder/solid
Revision:	1.1 (March 2000)

GENERAL INFORMATION

UNDECAGOLD (UG) is a cluster complex containing 11 gold atoms, prepared using a process that gives precise control over its surface properties. UNDECAGOLD particles are a uniform 0.8 nm in diameter, making them a suitable calibration standard for electron microscopy. They do not aggregate, as do colloidal gold products, nor do they possess affinity for proteins as colloidal gold particles do. This product does not posess active functionality: it cannot be linked specifically to proteins or antibodies. It is anticipated that this product will be used as a size or resolution standard for the electron microscope.

UNDECAGOLD particles should be frozen upon receipt, and stored at -20°C.

Warning: For research use only. Not recommended or intended for diagnosis of disease in humans or animals. Do not use internally or externally in humans or animals. Non radioactive and non carcinogenic.

PRODUCT SPECIFICATIONS

UNDECAGOLD is supplied as a solid, lyophilized from methanol solution. It is purified by gel filtration, and is stable under a wide range of pH conditions. It is soluble in water, alcohols, and dimethyl sulfoxide (DMSO); it is also soluble in aqueous buffer systems such as phosphate buffered saline (150 mM NaCl).

Extinction coefficients at specific wavelengths are given below for the solution as supplied:

WAVELENGTH (nm)	EXTINCTION COEFFICIENT ($M^{-1}cm^{-1}$)*
280	1.70×10^5
420	0.47×10^5

*Measured for 5×10^{-6} M solution in methanol.

INSTRUCTIONS FOR USE

The product is supplied as 50 nmol of solid. If you require less than this, then dissolve the sample in 1.0 mL of methanol and pipette the required amount into a polyethylene tube. The methanol may then be blown off using nitrogen; the dark brown residue may be dissolved in the required solvent. A methanol solution of UNDECAGOLD particles is stable for several months at 2 - 8°C.

SPECIAL CONSIDERATIONS FOR VIEWING UNDECAGOLD IN THE ELECTRON MICROSCOPE

UNDECAGOLD is the smallest gold probe commercially available, being just 0.8 nm in diameter. A high resolution instrument such as a Scanning Transmission Eelectron Microscope (STEM) is required for visualization; in a conventional TEM the UNDECAGOLD particles are not visible. With careful work, however, UNDECAGOLD may be seen directly in the STEM. However, achieving the high resolution necessary for this work may require new demands on your equipment and technique. Several suggestions follow:

1. Before you start a project with UNDECAGOLD it is helpful to see it so you know what to look for. Dilute the UNDECAGOLD stock 1:5 in methanol and apply 4 µl to a grid for 1 minute. Allow to dry.
2. View UNDECAGOLD using a full width scan of 128 nm or less; this will give sufficient magnification for visualization.
3. UNDECAGOLD is sensitive to beam damage (contrary to NANOGOLD® which is very beam-resistant); the behavior of UNDERCAGOLD in the STEM has been described in the literature.[2] Image at approximately 200 e Å^{-2}.
4. In order to operate at high magnification, thin carbon film over fenestrated holey film is recommended. Many plastic supports are unstable under these conditions of high magnification/high beam current and carbon is therefore preferred. Contrast is best using thinner films.

SILVER ENHANCEMENT OF UNDECAGOLD FOR EM

UNDECAGOLD will nucleate silver deposition resulting in a dense particle 2-20 nm in size or larger depending on development time. However, silver enhancement will be slower and much less uniform than with larger gold particles such as NANOGOLD™.[2] If specimens are to be embedded, silver enhancement is usually performed after embedding, although it may be done first. It must be completed before any staining reagents such as osmium tetroxide, lead citrate or uranyl acetate are applied, since these will nucleate silver deposition in the same manner as gold and produce non-specific staining.

Our LI SILVER silver enhancement system is convenient and not light sensitive, and suitable for all applications. Improved results in the EM may be obtained using HQ SILVER, which is formulated to give slower, more controllable particle growth and uniform particle size distribution.

Specimens must be thoroughly rinsed with deionized water before silver enhancement reagents are applied. This is because the buffers used for antibody incubations and washes contain chloride ions and other anions which form insoluble precipitates with silver. These are often light-sensitive and will give non-specific staining. To prepare the developer, mix equal amounts of the enhancer and initiator immediately before use. UNDECAGOLD will nucleate silver deposition resulting in a dense particle 2-20 nm in size or larger depending on development time. Use nickel grids (not copper).

Silver enhancement is performed as follows:

1. Rinse with deionized water (2 X 5 mins).
2. Float grid with specimen on freshly mixed developer for 1-4 minutes, or as directed in the instructions for the silver reagent. More or less time can be used to control particle size. A series of different development times should be tried, to find the optimum time for your experiment.
3. Rinse with deionized water (3 X 1 min).
4. Mount as usual.

REFERENCES

1. J. F. Hainfeld, in "Colloidal Gold: Principles, Methods and Applications," M. A. Hayat, ed., Academic Press, New York,

1989; Vol. 1, p. 413

2. Hainfeld, J. F., and Furuya, F. R.; *Proc. 52nd Ann. Mtg., Micros. Soc. Amer.*; Bailey, G. W., and Garratt-Reed, A. J. (Eds.); San Francisco Press, San Francisco, CA, **1994**, p. 130.

Technical Assistance Available.

For a complete list of references citing this product, please visit our world-wide-web site at http://www.nanoprobes.com/Ref.html.