

PRODUCT DATA SHEET

NHS-Activated Silver Nanoparticle Conjugation Kit

Description

Cytodiagnosics NHS-activated Silver Nanoparticle Conjugation Kits have been optimized for high efficiency one-step conjugations of proteins and other primary amine-containing ligands to silver nanoparticles with diameters in the size range of 10nm-100nm.

The kit contains ready-to-use pre-made mixtures. No activation or manipulation of the silver nanoparticles is required prior to conjugation, which often results in poor performing conjugates. Simply mix your protein with the pre-activated NHS ester silver nanoparticles supplied in the kit.

Kits are available in convenient 3 or 10 small-scale reactions formats allowing multiple to be conjugated simultaneously and ready for use in 2.5 hours or less. These kits are ideal for screening and optimization purposes prior to scale-up production. Scale up can be performed with our NHS-Activated Silver Nanoparticle Conjugation MIDI kits.

Features & Benefits

- Results in covalently bound ligand and more stable conjugate.
- Fast and convenient one-step conjugation reaction with no pre-activation requirements
- Spacer between the silver nanoparticle surface and conjugated ligand minimizes effects on the tertiary protein structure, which can lead to poor performing conjugates, which is a common problem seen in conjugates prepared by passive adsorption.

Applications

- Ideal for development of protein silver conjugates for use in applications such as blotting, lateral flow assays, microscopy and transmission electron microscopy (TEM).

Kit Components

- NHS-Activated Silver Nanoparticles (lyophilized)
- Protein Re-suspension Buffer
- Reaction Buffer
- Quencher Solution

NHS-Activated Silver Nanoparticle Specifications

Silver surface: NHS-ester (spacer between silver surface and NHS-group)

Core diameter: Available with diameters from 10nm-100nm

Amount of Silver Nanoparticles: 0.4 mg/reaction (3 reaction and 10 reaction kits) & 4 mg/reaction (MIDI Kit)

Lambda max: Core size dependant, please see table II.

Particles are supplied in ready to use lyophilized format.

Storage

All components of this kit should be stored at -20°C. If stored unopened and as specified, Cytodiagnosics NHS-activated silver nanoparticles are stable for at least 3 months.

Product Safety and Handling

This product is for R&D use only, not for drug, household, or other uses. Please review the material safety datasheet (MSDS) available online for proper safety and handling procedures.

Factors to Consider Prior to Conjugation

The protein/antibody or other ligand to be conjugated needs to be in a purified form, and proper care must be taken to ensure that the ligand stock is devoid of the following for proper functionality:

- No additional protein additives such as BSA
- Avoid free amino acids (e.g. glycine)
- Avoid common thiol additives such as DTT, TCEP and mercaptoethanol
- Avoid EDTA
- Avoid primary amine containing buffers or components (e.g. Tris)
- Avoid use of strong buffers that might change the pH of the conjugation reaction. See paragraph below for recommended buffers for optimal performance of the kit.

If your protein/antibody stock contains any of the above, dialyse or use a desalting column to transfer your ligand into a compatible buffer such as sodium phosphate, MES, MOPS or HEPES. If contaminating proteins such as BSA is present, the protein needs to be purified prior to conjugation.

Conjugation Protocol

A recommended starting protocol for conjugation can be found below. Note that the amount of protein added may need to be optimized for your particular protein.

1. Allow all reagents to warm to room temperature before use.
2. Using the supplied protein re-suspension buffer, dilute or dissolve your protein/antibody to the final concentration suitable for the particular silver nanoparticle size to be conjugated as indicated in table I (page 3).
3. In a microcentrifuge tube combine your diluted protein sample with reaction buffer according to the table below.

	3 or 10 Small Scale Reaction Format Kits	Midi Kits
Reaction Buffer	60µl	600µl
Diluted Protein Solution	48µl	480µl
Total Volume	108µl	1080µl

4. Transfer 90µl (900µl for the Midi Kit) of your protein/reaction buffer mix prepared in step 3 to one of the vials containing lyophilized NHS-activated silver nanoparticles and immediately mix well by pipetting up and down.

Note: *Do not resuspend the lyophilized NHS-activated silver nanoparticles in buffer prior to addition of protein. NHS rapidly hydrolyzes in aqueous solution and may result in loss of conjugation efficiency.*

5. Incubate the vial at room temperature for at least 2 hours.
6. Add 10µl (100µl for Midi Kit) of quencher solution to the vial to stop the reaction.
7. Using a microcentrifuge, centrifuge the vial for 30 minutes using the appropriate speed for the silver

nanoparticle size you are using according to the table below.

Silver Nanoparticle Diameter	Centrifugation Force
10nm	100 kDa MWC Spin Column
20nm	17,000 x g
30nm	11,000 x g
40nm	3,000 x g
50nm	2,000 x g
60nm	900 x g
80nm	500 x g
100nm	300 x g

8. Discard the supernatant containing unbound protein.
9. Add 100ul (1ml for Midi Kit) of silver conjugate storage buffer to the vial to re-suspend your conjugate.

*** Note:** *A silver conjugate storage buffer is not supplied with the kit. Use a standard biological buffer compatible with your protein.*

A recommended storage buffer for an antibody silver conjugate is 20mM Tris (pH 8.0), 150mM NaCl supplemented with 1% (w/v) BSA and 0.025% (w/v) Tween 20.

10. Record the UV-VIS spectra of the conjugate using a spectrophotometer, and dilute to desired optical density using silver conjugate storage buffer.
11. Store your protein conjugate at 4°C until use.

Your conjugate is now ready for use!

Table I. Suggested protein concentrations to be used for step 2 in the conjugation protocol above based on the silver nanoparticle size to be conjugated. Note that the concentrations in the table below are optimized for an antibody with a molecular weight of 150kDa. For proteins differing significantly in molecular weights the amounts indicated might need to be optimized for optimal performance.

Silver Nanoparticle Diameter	Suggested Protein Concentration
10nm	3 mg/ml
20nm	1 mg/ml
30nm	1 mg/ml
40nm	0.5 mg/ml
50nm	0.5 mg/ml
60nm	0.5 mg/ml
80nm	0.5 mg/ml
100nm	0.5 mg/ml

Table II. Silver nanoparticle specifications by size. Please note that all values below are at the optical density indicated in the table (OD/cm^{-1}) at their respective λ_{max} . At other optical densities the values needs to be adjusted (e.g. $NPS/ml (@OD2) = 2 \times NPS/ml (@OD1)$).

Diameter (nm)	Peak SPR Wavelength (nm)	Optical Density	NPS/ml	Wt. Conc. (mg/ml)	Size Dispersity (+/-nm)	Particle Volume (nm^3)	Surface Area (nm^2)	Surface/Volume Ratio	Particle Mass (g)	Molar Mass (g/mol)	Molar Co
10	390-405	2.5	$\sim 3.6E+12$	~ 0.02	<18%	$5.24E+02$	$3.14E+02$	0.6	$5.49E-18$	$3.31E+06$	$5.98E-09$
20	390-410	2.5	$\sim 4.6E+11$	~ 0.02	<15%	$4.19E+03$	$1.26E+03$	0.3	$4.39E-17$	$2.65E+07$	$7.64E-10$
30	400-410	2.5	$\sim 1.4E+11$	~ 0.02	<15%	$1.41E+04$	$2.83E+03$	0.2	$1.48E-16$	$8.93E+07$	$2.32E-10$
40	405-425	2.5	$\sim 5.7E+10$	~ 0.02	<15%	$3.35E+04$	$5.03E+03$	0.15	$3.52E-16$	$2.12E+08$	$9.47E-11$
50	410-430	2.5	$\sim 2.9E+10$	~ 0.02	<12%	$6.54E+04$	$7.85E+03$	0.12	$6.87E-16$	$4.13E+08$	$4.28E-11$
60	425-450	2.0	$\sim 1.7E+10$	~ 0.02	<12%	$1.13E+05$	$1.13E+04$	0.1	$1.19E-15$	$7.14E+08$	$2.82E-11$
80	440-480	1.6	$\sim 7.1E+09$	~ 0.02	<12%	$2.68E+05$	$2.01E+04$	0.075	$2.81E-15$	$1.69E+09$	$1.18E-11$
100	480-520	0.92	$\sim 3.6E+09$	~ 0.02	<10%	$5.24E+05$	$3.14E+04$	0.06	$5.49E-15$	$3.31E+09$	$5.98E-12$



Catalogue Number	Description	Sizes
SN5K-10-X*	10nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-20-X*	20nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-30-X*	30nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-40-X*	40nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-50-X*	50nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-60-X*	60nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-80-X*	80nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit
SN5K-100-X*	100nm NHS-Activated Silver Nanoparticles Conjugation Kit	3 reactions, 10 reactions, MIDI Kit

*X Indicates quantity, i.e. -1 for a 3-reaction kit, -2 for a 10-reaction kit and -3 for a MIDI kit.
For custom sizes and information on bulk quantities and prices please contact our customer service department.

Ordering Information

For ordering call 866-344-3954 or visit us online at www.cytodiagnosics.com