

Sulfo-Cyanine 5 NHS ester

 Catalog number: 268, 269
 Unit size: 10 mg, 50 mg

Component	Storage	Amount (Cat No. 268)	Amount (Cat No. 269)
Sulfo-Cyanine 5 NHS ester	Freeze (< -15 °C), Minimize light exposure	1 vial (10 mg)	1 vial (50 mg)

OVERVIEW

A variety of cyanine dyes has been used to label biological molecules for fluorescence imaging and other fluorescence-based biochemical analysis. They are widely used for labeling peptides, proteins and oligos etc. Cy5® dyes are one type of the most common red fluorophores. These versatile fluorophores can tolerate a pH range of 3-10 for use in a variety of applications at biologically relevant pHs. The dyes are also DMSO tolerant and photostable to enable transfer from storage to assay without loss of performance. The aqueous solubility eliminates the need for organic solvents in the assay buffers. Sulfo-Cyanine 5 is an alternative dye primarily used for labeling peptides and oligos in replacing Cy5 that was originally developed by GE Healthcare (Cy5® is the trademark of GE Healthcare). NHS ester dyes are recommended for labeling amine groups and maleimide dyes are recommended for labeling thiol groups. This Cy5® NHS ester readily reacts with amino groups.

PREPARATION OF STOCK SOLUTIONS

Unless otherwise noted, all unused stock solutions should be divided into single-use aliquots and stored at -20 °C after preparation. Avoid repeated freeze-thaw cycles.

1. Protein stock solution (Solution A)

Mix 100 µL of a reaction buffer (e.g., 1 M sodium carbonate solution or 1 M phosphate buffer with pH ~9.0) with 900 µL of the target protein solution (e.g. antibody, protein concentration >2 mg/mL if possible) to give 1 mL protein labeling stock solution. **Note:** The pH of the protein solution (Solution A) should be 8.5 ± 0.5. If the pH of the protein solution is lower than 8.0, adjust the pH to the range of 8.0-9.0 using 1 M sodium bicarbonate solution or 1 M pH 9.0 phosphate buffer. **Note:** The protein should be dissolved in 1X phosphate buffered saline (PBS), pH 7.2-7.4. If the protein is dissolved in Tris or glycine buffer, it must be dialyzed against 1X PBS, pH 7.2-7.4, to remove free amines or ammonium salts (such as ammonium sulfate and ammonium acetate) that are widely used for protein precipitation. **Note:** Impure antibodies or antibodies stabilized with bovine serum albumin (BSA) or gelatin will not be labeled well. The presence of sodium azide or thimerosal might also interfere with the conjugation reaction. Sodium azide or thimerosal can be removed by dialysis or spin column for optimal labeling results. **Note:** The conjugation efficiency is significantly reduced if the protein concentration is less than 2 mg/mL. For optimal labeling efficiency the final protein concentration range of 2-10 mg/mL is recommended.

2. Sulfo-Cyanine 5 NHS ester stock solution (Solution B)

Add anhydrous DMSO into the vial of Sulfo-Cyanine 5 NHS ester to make a 10 mM stock solution. Mix well by pipetting or vortex. **Note:** Prepare the dye stock solution (Solution B) before starting the conjugation. Use promptly. Extended storage of the dye stock solution may reduce the dye activity. Solution B can be stored in freezer for two weeks when kept from light and moisture. Avoid freeze-thaw cycles.

SAMPLE EXPERIMENTAL PROTOCOL

This labeling protocol was developed for the conjugate of Goat anti-mouse IgG with Sulfo-Cyanine 5 NHS ester. You might need further optimization for your particular proteins. **Note:** Each protein requires distinct dye/protein ratio, which also depends on the properties of dyes. Over labeling of a protein could detrimentally affect its binding affinity while the protein conjugates of low dye/protein ratio gives reduced sensitivity.

Run conjugation reaction

1. Use 10:1 molar ratio of Solution B (dye)/Solution A (protein) as the starting point: Add 5 µL of the dye stock solution (Solution B, assuming the dye stock solution is 10 mM) into the vial of the protein solution (95 µL of Solution A) with effective shaking. The concentration of the protein is ~0.05 mM assuming the protein concentration is 10 mg/mL and the molecular weight of the protein is ~200KD. **Note:** We recommend to use 10:1 molar ratio of Solution B (dye)/Solution A (protein). If it is too less or too high, determine the optimal dye/protein ratio at 5:1, 15:1 and 20:1 respectively.
2. Continue to rotate or shake the reaction mixture at room temperature for 30-60 minutes.

Purify the conjugation

The following protocol is an example of dye-protein conjugate purification by using a Sephadex G-25 column.

1. Prepare Sephadex G-25 column according to the manufacture instruction.
2. Load the reaction mixture (From "Run conjugation reaction") to the top of the Sephadex G-25 column.
3. Add PBS (pH 7.2-7.4) as soon as the sample runs just below the top resin surface.
4. Add more PBS (pH 7.2-7.4) to the desired sample to complete the column purification. Combine the fractions that contain the desired dye-protein conjugate. **Note:** For immediate use, the dye-protein conjugate need be diluted with staining buffer, and aliquoted for multiple uses. **Note:** For longer term storage, dye-protein conjugate solution need be concentrated or freeze dried.

EXAMPLE DATA ANALYSIS AND FIGURES

Characterize the Desired Dye-Protein Conjugate

The Degree of Substitution (DOS) is the most important factor for characterizing dye-labeled protein. Proteins of lower DOS usually have weaker fluorescence intensity, but proteins of higher DOS (e.g. DOS > 6) tend to have reduced fluorescence too. The optimal DOS for most antibodies is recommended between 2 and 10 depending on the properties of dye and protein. For effective labeling, the degree of substitution should be controlled to have 6-8 moles of Sulfo-Cyanine 5 NHS ester to one mole of antibody. The following steps are used to determine the DOS of Sulfo-Cyanine 5 NHS ester labeled proteins.

Measure absorption

To measure the absorption spectrum of a dye-protein conjugate, it is recommended to keep the sample concentration in the range of 1-10 µM depending on the extinction coefficient of the dye.

Read OD (absorbance) at 280 nm and dye maximum absorption (λ_{max} = 651 nm for Sulfo-Cyanine 5 NHS ester dyes)

For most spectrophotometers, the sample (from the column fractions) need be diluted with de-ionized water so that the OD values are in the range of 0.1 to 0.9. The O.D. (absorbance) at 280 nm is the maximum absorption of protein while 651 nm is the maximum absorption of Sulfo-Cyanine 5 NHS ester. To obtain accurate DOS, make sure that the conjugate is free of the non-conjugated dye.

Calculate DOS

You can calculate DOS using our tool by following this link:
<https://www.aatbio.com/tools/degree-of-labeling-calculator>

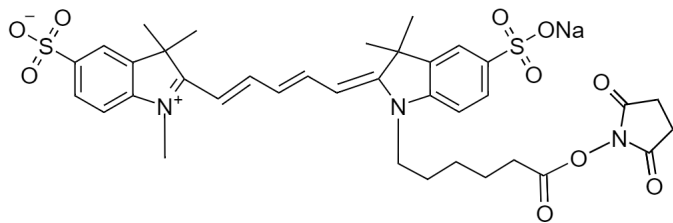


Figure 1. Chemical structure for Sulfo-Cyanine 5 NHS ester

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