

XFD488 NHS Ester-UltraPure Grade

Catalog number: 1810, 71901
Unit size: 1 mg, 5 mg

Component	Storage	Amount (Cat No. 1810)	Amount (Cat No. 71901)
XFD488 NHS Ester-UltraPure Grade [equivalent to Alexa Fluor™ 488 NHS Ester]	Freeze (< -15 °C), Minimize light exposure	1 vial (1 mg)	1 vial (5 mg)

OVERVIEW

XFD488 is manufactured by AAT Bioquest, and it has a chemical structure similar to that of Alexa Fluor® 488 (Alexa Fluor® is the trademark of Thermo Fisher). XFD488 NHS Ester (Succinimidyl Ester) has the same molecule as Alexa Fluor® 488 NHS Ester (#A20000 and A20100 from Thermo Fisher). It is a bright green-fluorescent dye optimal for use with the 488 nm Argon laser. XFD488 dye is water soluble and pH-insensitive from pH 4 to pH 10. XFD488 NHS ester (or succinimidyl ester) is the most convenient amine-reactive form for conjugating this dye to a protein or antibody. Although the Alexa Fluor® 488 NHS Ester is one of the most common green fluorescent labeling dyes, its purity has been quite challenging. Thermo Fisher provides it with purity of ~50–60% while a few other vendors offer it at even lower purities. Among all the impurities, we noted that the Bis-NHS ester of XFD488 is quite detrimental since it could give a non-fluorescent product. This high purity XFD488 NHS ester is free of the detrimental XFD488 Bis-NHS ester impurity with the minimal purity of >75%.

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

Protein Stock Solution (Solution A)

1. Prepare a 1 mL protein labeling stock solution by mixing 100 µL of reaction buffer (such as 1 M sodium bicarbonate solution or 1 M phosphate buffer, pH ~9.0) with 900 µL of the target protein solution (e.g., an antibody with a protein concentration of at least 2 mg/mL, if possible).

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 it to within the 8.0–9.0 range using either 1 M sodium bicarbonate solution or 1 M phosphate buffer at pH 9.0.

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, dialyze it against 1X PBS, pH 7.2–7.4, to remove any free amines or ammonium salts (such as ammonium sulfate and ammonium acetate) commonly used in protein precipitation.

Note: Antibodies that are impure or stabilized with bovine serum albumin (BSA) or gelatin may not label effectively. Additionally, sodium azide or thimerosal can interfere with the conjugation reaction. To achieve optimal labeling results, these preservatives should be removed through dialysis or spin column techniques.

Note: For optimal labeling efficiency, it is recommended to maintain a final protein concentration between 2–10 mg/mL. Protein concentrations below 2 mg/mL can significantly reduce conjugation efficiency.

XFD488 NHS Ester Stock Solution (Solution B)

1. To prepare a 10 mM stock solution of XFD488 NHS ester, add anhydrous DMSO directly to the vial of XFD488 NHS ester. Mix well by pipetting or vortexing.

Note: Prepare the dye stock solution (Solution B) before starting the conjugation, and use it promptly. Extended storage of the dye stock solution may reduce the dye activity. Solution B can be stored in the freezer for up to two weeks, provided it is protected from light and moisture. Avoid freeze-thaw cycles.

SAMPLE EXPERIMENTAL PROTOCOL

This protocol is designed for labeling Goat anti-mouse IgG with XFD488 NHS ester. Additional optimization may be required to adapt the protocol to your specific proteins.

Note: Each protein requires a distinct dye/protein ratio, which varies depending on the characteristics of the dye. Over-labeling a protein can negatively impact its binding affinity, whereas using a low dye-to-protein ratio in protein conjugates can result in reduced sensitivity.

Run Conjugation Reaction

1. Use a 10:1 molar ratio of Solution B (dye) to 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) to the vial containing 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 using a 10:1 molar ratio of Solution B (dye)/Solution A (protein). If it is too low 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 Conjugate

The following protocol demonstrates the purification of a dye-protein conjugate using a Sephadex G-25 column.

1. Prepare the Sephadex G-25 column according to the manufacturer's instructions.
2. Carefully load the reaction mixture (from the "Run Conjugation Reaction" step) 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 must be diluted with staining buffer, and aliquoted for multiple uses.

Note: For longer-term storage, the dye-protein conjugate solution needs to be concentrated or freeze-dried.

Characterize the Desired Dye-Protein Conjugate

The Degree of Substitution (DOS) is a critical factor in characterizing dye-labeled proteins. Proteins with a lower DOS generally exhibit weaker fluorescence, while those with a higher DOS (e.g., DOS > 6) may also show reduced fluorescence. The optimal DOS for most antibodies typically ranges between 2 and 10, depending on the specific properties of both the dye and the protein. For effective labeling, it is recommended to achieve a DOS of 6-8 moles of XFD488 NHS ester per mole of antibody. The following steps outline the process for determining the DOS of XFD488 NHS ester-labeled proteins.

Measure Absorption

For accurate measurement of the absorption spectrum of a dye-protein conjugate, maintain the sample concentration between 1-10 μ M, adjusting as needed based on the dye's extinction coefficient.

Read OD (absorbance) at 280 nm and Dye Maximum Absorption (λ_{max} = 499 nm for XFD488 NHS Ester)

For most spectrophotometers, the sample (from the column fractions) needs to be diluted with de-ionized water so that the O.D. 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 499 nm is the maximum absorption of XFD488 NHS ester. To obtain accurate DOS, ensure 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>

DISCLAIMER

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