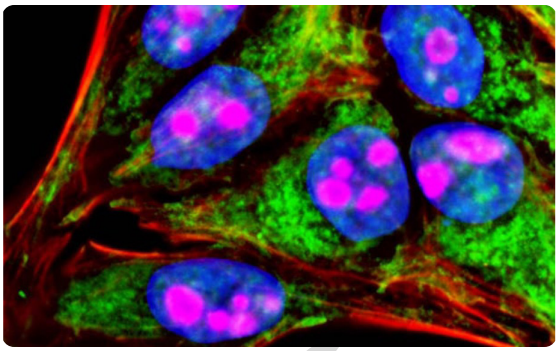
Power Your Spatial Analysis with TyraMax™ Amplification Dyes



High-Performance Tyramide Signal Amplification for Multiplexed Tissue Imaging

Tyramide signal amplification (TSA) is a highly sensitive approach for detecting low-abundance targets in immunocytochemistry (ICC), immunohistochemistry (IHC), and *in situ* hybridization (FISH). In spatial biology applications, TSA enables robust, high-contrast signal detection in complex tissues while preserving spatial and morphological context.

The TyraMax™ Amplification Dyes and Kits are Biotium's TSA reagents, purposefully designed to support high-plex immunofluorescence, spectral imaging, and automated workflows in spatial biology applications.

Optimized for use in FFPE tissues, cryosections, and cultured cells, TyraMax™ dyes enable robust detection of low-abundance targets while preserving spatial and morphological context across multiple rounds of staining.

Advantages of TyraMax™ Amplification Dyes

- **Largest selection of tyramide colors available**: With options from blue to near-IR
- **Bright and photostable**: Advantages in brightness and/or photostability compared to other TSA dyes
- **Improved reagent stability**: Stable in amplification buffer for up to 24 hours, facilitating automated workflows
- **Automation compatible**: Compatible with automated workflows
- **Compatible with sequential staining protocols**: Supports CycIF and antibody stripping strategies for high multiplex staining
- **Flexible purchasing options**: Available as standalone dyes, trial sizes, or multiplex dye sets

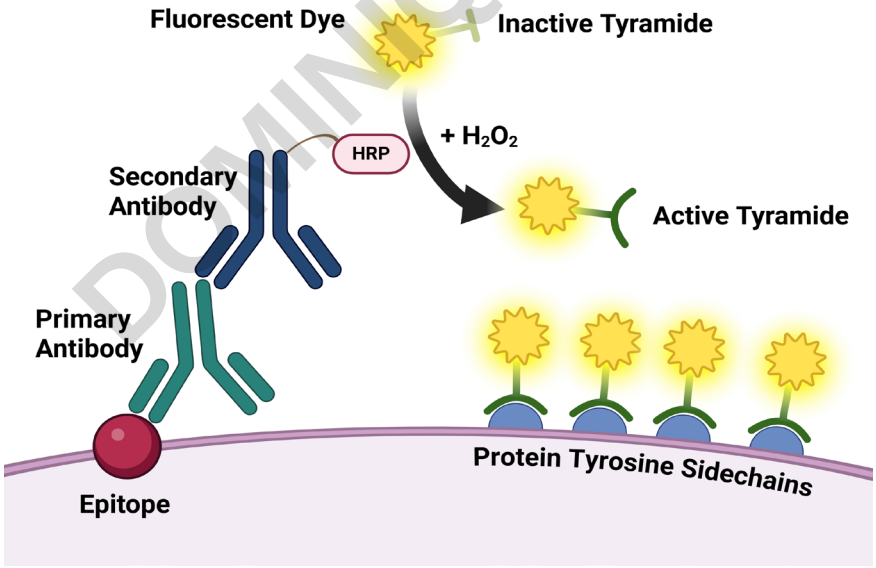


Figure 1. Illustration of the tyramide signal amplification system. Created in BioRender. Davis, J. (2026) https://app.biorender.com/illustrations/697a8eefca57109a76322817.

How Does TSA Work?

TSA uses horseradish peroxidase (HRP) to catalyze deposition of labeled tyramide near a target protein or nucleic acid. In low concentrations of H_2O_2, HRP converts tyramide into a highly reactive intermediate that covalently binds nearby tyrosine residues, generating dense, localized signal around the epitope.

Because the label is covalently deposited, the amplified signal remains anchored to the tissue even after antibody removal or enzyme inactivation, enabling sequential staining and multiplex detection.

Tyramide can be labeled with fluorophores or haptens, such as biotin, DNP, and DIG. This supports flexible detection strategies across imaging platforms.

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TyraMax™ Amplification Dyes

TSA Dyes Optimized for Multiplexing

Biotium's TyraMax™ line offers the widest selection of TSA dye colors on the market, with options spanning from blue to near-infrared for unmatched multiplexing flexibility and spectral panel design. All TyraMax™ dyes are chemically stable in amplification buffer for at least 24 hours, making them ideal for automated and high-throughput staining workflows commonly used in spatial biology platforms (Figure 3A). These dyes yield a brighter signal compared to our original CF® Dye tyramides, and have advantages in brightness, photostability, and working solution stability compared to other TSA dyes (Figure 3B). Engineered for manual and automated staining platforms, TyraMax™ dyes support sequential and cyclic immunofluorescence (CycIF) workflows by enabling stable, covalent signal deposition that withstands antibody stripping or enzyme inactivation.

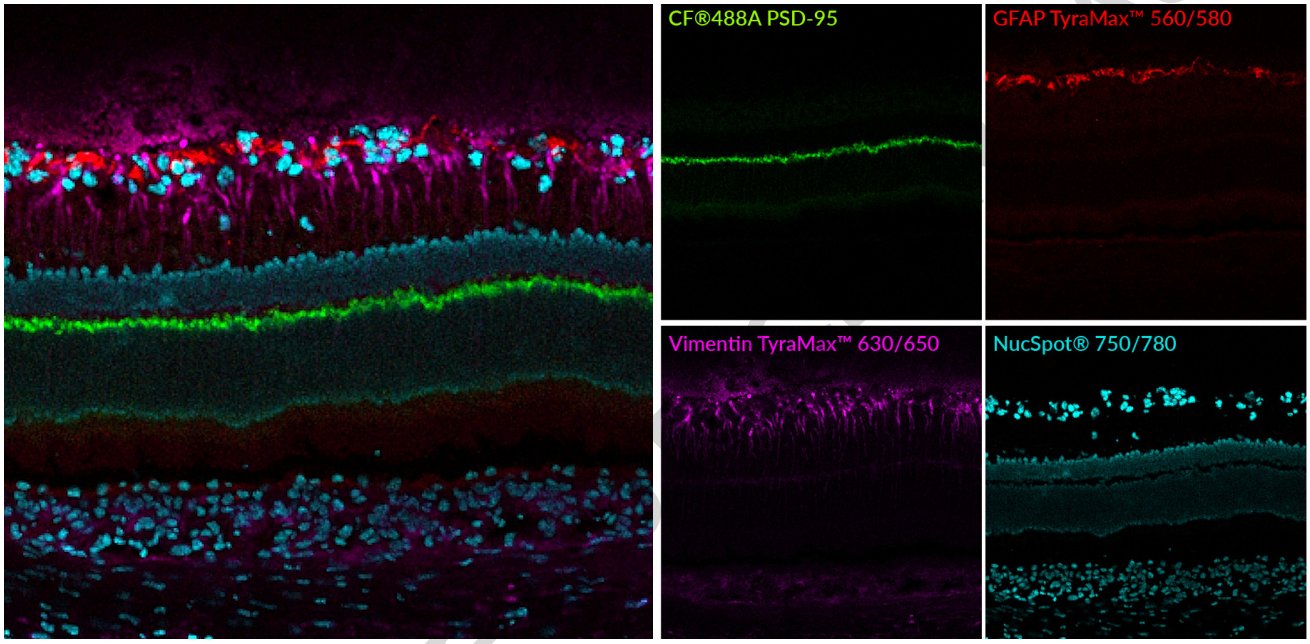


Figure 2. PFA-fixed rat eye cryosection stained with Vimentin Recombinant Monoclonal Mouse Antibody (rV9) HRP conjugate with TyraMax™ 630/650 (magenta), GFAP Recombinant Monoclonal Mouse Antibody (rGA5) HRP conjugate with TyraMax™ 560/580 (red), and CF®488A PSD95 Recombinant Monoclonal Mouse Antibody (rK28/43) (green). Nuclei are stained with NucSpot® 750/780 (cyan).

TyraMax™ Amplification Dyes

Dye	Ex/Em (nm)	Laser Line (nm)	Detection Channel	Cat. No.	Dye Features
TyraMax™ 410/450	408/452	405	DAPI/ Alexa Fluor® 405	96134	Unique tyramide color, spectrally similar to Alexa Fluor® 405
TyraMax™ 430/500	421/497	405	FITC	96135	Brighter than Aluora® 430 and Opal® 480
TyraMax™ 400/550	394/547	405	FITC	96136	Unique tyramide color, spectrally similar to Pacific Orange®. Ideal for expanded multiplexing using the 405 laser
TyraMax™ 490/520	497/518	488	FITC	96137	Brighter than Opal® 520, replacement for Aluora® 488
TyraMax™ 555/565	594/569	552 or 569	TRITC	96138	Brighter than Opal® 570, replacement for Aluora® 555
TyraMax™ 560/580	562/584	555 or 561	TRITC	96139	Alternative to Aluora® 555, Opal® 570 with superior photostability
TyraMax™ 630/650	631/650	633 or 640	Cy®5	96140	Bright and photostable alternative to Aluora® 647, Opal® 650
TyraMax™ 647/670	650/670	633 or 640	Cy®5	96141	Brighter than Opal® 650, replacement for Aluora® 647
TyraMax™ 660/680	663/683	633 or 640	Alexa Fluor® 680	96142	Unique tyramide color, spectrally similar to Alexa Fluor® 660. Brighter and more photostable than Opal® 690 when excited at 640 nm
TyraMax™ 680/700	680/701	685*	Alexa Fluor® 680*	96143	Brighter and more photostable than Opal® 690 when excited at 685 nm
TyraMax™ 710/740	711/736	685	Alexa Fluor® 700	96144	Brighter and more photostable than Aluora® 700
TyraMax™ 740/770	742/768	730	Alexa Fluor® 750	96145	Single-step detection, unlike Opal® 780. Stable in amplification buffer for up to 24 hours, unlike Aluora® 750

*Detectable with 640 nm excitation.

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TyraMax™ Amplification Dye Kits

Convenient Multiplex Kits for Spatial Analysis

The TyraMax™ Amplification Dye Sets provide a streamlined solution for TSA in multiplexed spatial biology workflows by offering curated sets of spectrally distinct tyramide dyes optimized for high-plex imaging. Available as 3-plex and 5-plex dye sets, as well as a spectral sampler kit, TyraMax™ Kits simplify panel design and support flexible customization for spatially resolved analysis of complex tissues.

TyraMax™ 3-Plex Amplification Dye Set with DAPI

Component Name	Cat. No.	Size
TyraMax™ 490/520, 100X, 100 uL	96137-100UL	For 100 samples using 100 uL staining volume
TyraMax™ 560/580, 100X, 100 uL	96139-100UL	
TyraMax™ 630/650, 100X, 100 uL	96140-100UL	
DAPI, 1000X, 50 uL	99897-50UL	

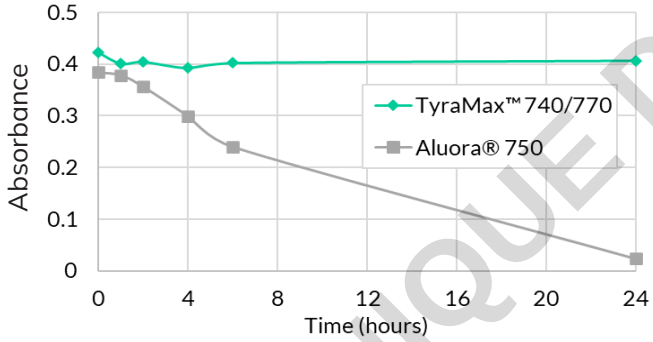
TyraMax™ 5-Plex Amplification Dye Set with DAPI

Component Name	Cat. No.	Size
TyraMax™ 490/520, 100X, 100 uL	96137-100UL	For 100 samples using 100 uL staining volume
TyraMax™ 560/580, 100X, 100 uL	96139-100UL	
TyraMax™ 630/650, 100X, 100 uL	96140-100UL	
TyraMax™ 680/700, 100X, 100 uL	96143-100UL	
TyraMax™ 740/770, 100X, 100 uL	96145-100UL	
DAPI, 1000X, 50 uL	99897-50UL	

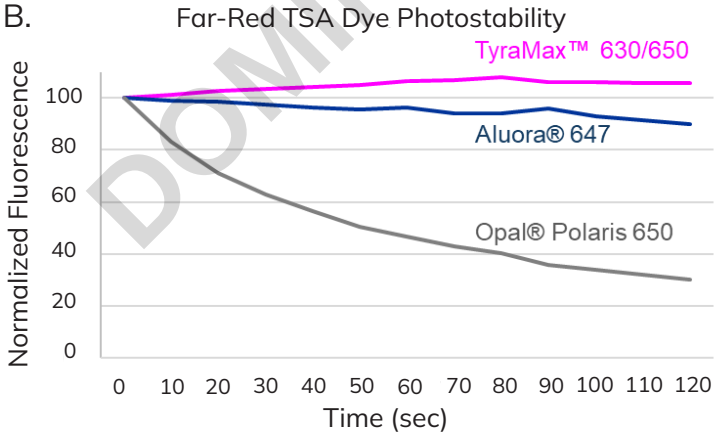
TyraMax™ Amplification Dye Spectral Sampler

Component Name	Cat. No.	Size
TyraMax™ 410/450	96134-20UL	For 20 samples per vial using 100 uL staining volume
TyraMax™ 430/500	96135-20UL	
TyraMax™ 400/550	96136-20UL	
TyraMax™ 490/520	96137-20UL	
TyraMax™ 555/565	96138-20UL	
TyraMax™ 560/580	96139-20UL	
TyraMax™ 630/650	96140-20UL	
TyraMax™ 647/670	96141-20UL	
TyraMax™ 660/680	96142-20UL	
TyraMax™ 680/700	96143-20UL	
TyraMax™ 710/740	96144-20UL	
TyraMax™ 740/770	96145-20UL	

A.



B.



C.

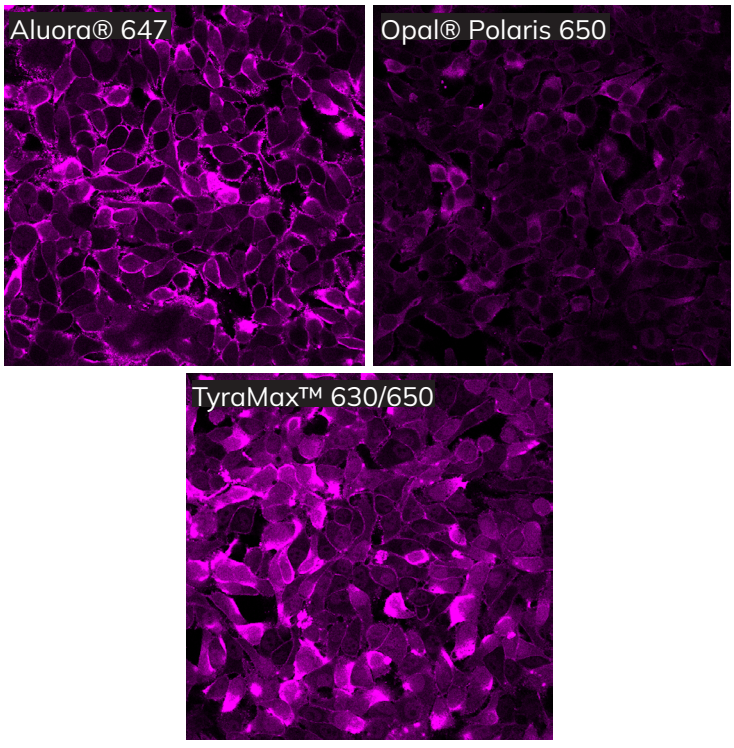


Figure 3. A) TyraMax™ 740/770 is stable in working solution for at least 24 hours. Aluora® 750 completely degrades overnight. OD-matched solutions of TyraMax™ 740/770 and Aluora® 750 dyes were prepared in Tyramide Amplification Buffer Plus with 0.0015% H_2O_2. An Agilent Cary 60 spectrophotometer measured absorbance. Solutions were left at room temperature, protected from light, and absorbance was measured at various time points up to 24 hours. B-C) TyraMax™ 630/650 has excellent brightness and photostability compared to similar TSA dyes. PFA-fixed HeLa cells stained with WGA-HRP were detected with TyraMax™ 630/650 Amplification Dye, Opal® Polaris 650 Reagent, or Aluora® 647 Spatial dye. Imaged using a 40X oil objective on Evident FV4000 confocal system with 640 nm excitation in the Alexa Fluor® 647 detection channel. Photostability was measured with an Olympus IX71 epifluorescence microscope using a Cy®5 filter cube. Cells were imaged every 10 seconds for 120 seconds. Mean fluorescence was normalized to the first image taken.

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Tyramide Amplification Kits, Amplification Buffers, & Other Tyramide Dyes

Tyramide Amplification Kits

Biotium's Tyramide Amplification Kits provide all critical reagents for tyramide labeling. They feature our bright and photostable CF® Dyes or biotin as reactive tyramides with an anti-mouse, anti-rabbit, or streptavidin HRP conjugate. The kits include our Tyramide Amplification Buffer Plus, peroxide solution, and BSA for blocking.

Tyramide Signal Amplification Kits

Tyramide Label	Ex/Em (nm)	Secondary Conjugate	Cat. No.
CF®488A	490/515	Goat anti-mouse HRP	33000
		Goat anti-rabbit HRP	33001
		Streptavidin HRP	33002
CF®543	541/560	Goat anti-mouse HRP	33003
		Goat anti-rabbit HRP	33004
		Streptavidin HRP	33005
CF®568	562/583	Goat anti-mouse HRP	33006
		Goat anti-rabbit HRP	33007
		Streptavidin HRP	33008
CF®594	593/614	Goat anti-mouse HRP	33009
		Goat anti-rabbit HRP	33010
		Streptavidin HRP	33011
CF®640	642/662	Goat anti-mouse HRP	33012
		Goat anti-rabbit HRP	33013
		Streptavidin HRP	33014
CF®680R	680/701	Goat anti-mouse HRP	33015
		Goat anti-rabbit HRP	33016
		Streptavidin HRP	33017
Biotin-XX	N/A	Goat anti-mouse HRP	33018
		Goat anti-rabbit HRP	33019
		Streptavidin HRP	33020

Standalone Dye and Hapten Labeled Tyramides

Tyramide Label	Ex/Em (nm)	Cat. No.
CF®350	347/448	92170
CF®405L	395/545	92198
CF®405S	404/431	92197
CF®405M	408/452	96057
CF®430	426/498	96053
CF®488A*	490/515	92171
FITC	492/514	96018
CF®514	516/548	92199
CF®532	527/558	96066
CF®543*	541/560	92172
CF®550R	551/577	96077
CF®555	555/565	96021
Cyanine 555	555/565	96020
CF®568*	562/583	92173
CF®583R	586/609	96085
CF®594*	593/614	92174
CF®620R	617/639	92194
CF®640R*	642/662	92175
CF®647	650/665	96022
CF®660R	663/682	92195
CF®680R*	680/701	92196
CF®710	712/736	96127
CF®725	729/755	96128
CF®740	742/767	96124
CF®750	755/779	96052
CF®754	748/793	96090
Biotin-XX*	N/A	92176
DNP	N/A	96019

*Available as part of a Tyramide Amplification Kit.

Tyramide Amplification Buffers

Tyramide Amplification Buffer Plus has enhanced sensitivity for TSA, with improved brightness, specificity, and sensitivity over our original Ready-to-Use Tyramide Amplification Buffer.

Tyramide Amplification Buffers

Product	Size	Cat. No.
Ready-to-Use Tyramide Amplification Buffer, 1X	25 mL	22027-25mL
	100 mL	22027-100mL
Tyramide Amplification Buffer Plus	250 reactions	22029-T
	1000 reactions	22029

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