

Silver stains

Ultrasensitive stains with optimized protocols and manufactured for minimal variability

Silver staining is the most sensitive colorimetric method for detecting total protein, and functions by the deposition of metallic silver at the location of protein bands. Silver ions (from silver nitrate in the stain reagent) interact and bind with certain protein functional groups. The strongest interactions occur with carboxylic acid groups (Asp and Glu), imidazole (His), sulfhydryl groups (Cys), and amines (Lys). Various sensitizer and enhancer reagents are essential for controlling the specificity and efficiency of silver ion binding to proteins and effective conversion (development) of the bound silver to metallic silver.

Key features:

- **Sensitive**—silver stains are highly sensitive stains that allow for visualization of proteins at subnanogram levels
- **Easy to use and flexible**—silver stains are optimized for minimal steps and have the flexibility to accommodate shorter or longer protocols
- **Workflow compatible**—our mild chemical formulations help ensure compatibility with mass spectrometry and sequencing
- **Robust performance**—detailed protocol enables consistent results with clear background



We offer highly sensitive silver stains with short protocol times that are also compatible with mass spectrometry. The Invitrogen™ SilverXpress™ Silver Staining Kit provides nanogram-level sensitivity with minimal background (Figures 38, 39), while the Thermo Scientific™ Pierce™ Silver Stain Kit provides protocol flexibility (Figures 40, 41).

Learn more at thermofisher.com/silverstains



Silver stain kits.

	Pierce Silver Stain for Mass Spectrometry	Pierce Silver Stain Kit	SilverXpress Silver Staining Kit
Components (steps)	6 (7)	4 (7)	5 (9)
Time required	1 hr 13 min	1 hr 30 min	2 hr
Limit of detection	0.25 ng	0.25 ng	0.86 ng
Mass spectrometry compatible	Yes	Yes	Yes
Storage	Room temperature	Room temperature	4°C
Stability	1 year	1 year	6 months
Advantages	- Fast and sensitive staining and destaining of protein gels - Optimized for peptide recovery after in-gel trypsin digestion for mass spectrometry - Flexible gel fixation (15–30 min to overnight) and staining (1–30 min)	- Rapid, ultrasensitive, and versatile silver stain system - Flexible gel fixation (30 min–overnight) and staining (5 min–20 hr)	Nanogram-level sensitivity for silver staining with minimal background

Protocols and example data

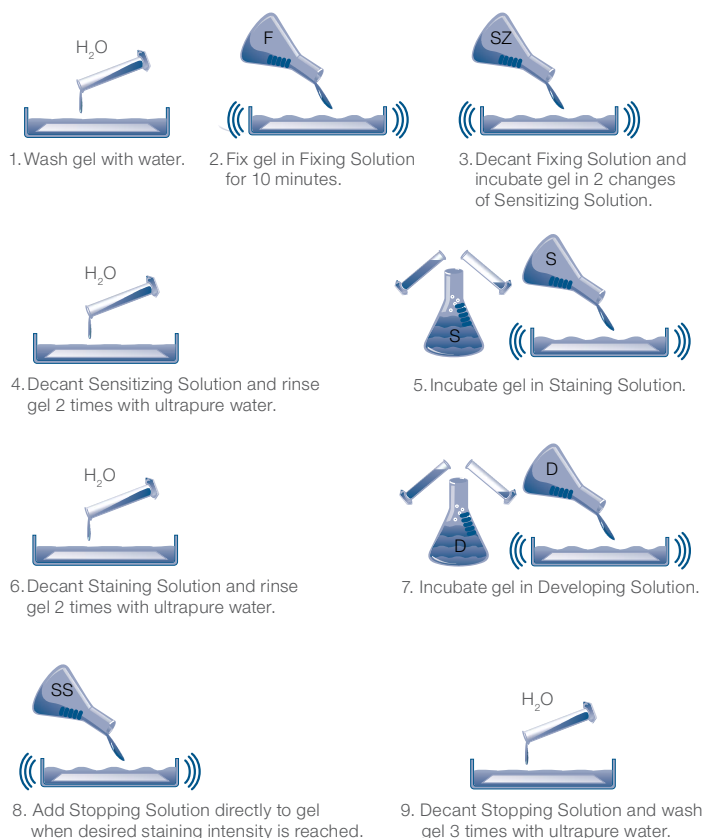


Figure 38. SilverXpress Silver Staining Kit protocol.

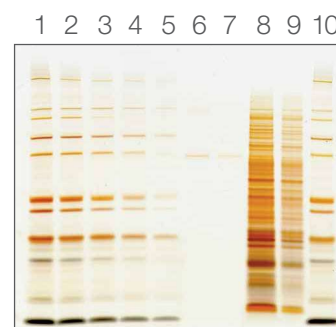


Figure 39. Crystal clear background with the SilverXpress Silver Staining Kit. Samples were separated on a NuPAGE 4–12% Bis-Tris gel and stained using the SilverXpress kit. **Lanes 1, 10:** Mark12 Unstained Standard (blend of 12 purified proteins) diluted 1:4; **lane 2:** Mark12 Unstained Standard diluted 1:8; **lane 3:** Mark12 Unstained Standard diluted 1:16; **lane 4:** Mark12 Unstained Standard diluted 1:32; **lane 5:** Mark12 Unstained Standard diluted 1:64; **lane 6:** 1.6 ng BSA; **lane 7:** 0.8 ng BSA; **lane 8:** *E. coli* lysate diluted 1:20; **lane 9:** *E. coli* lysate diluted 1:80.

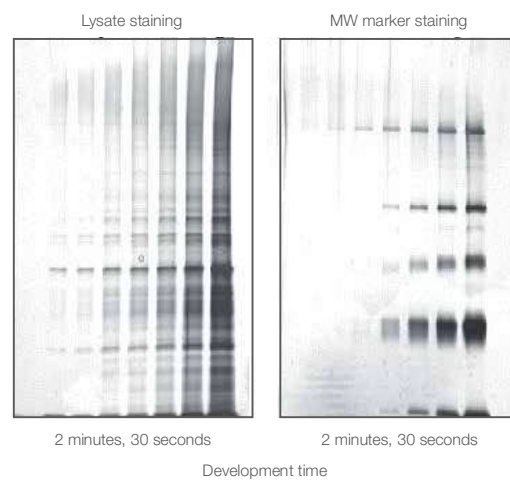
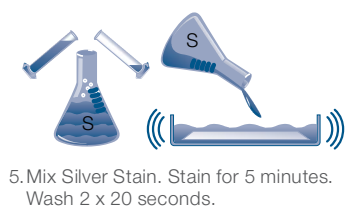
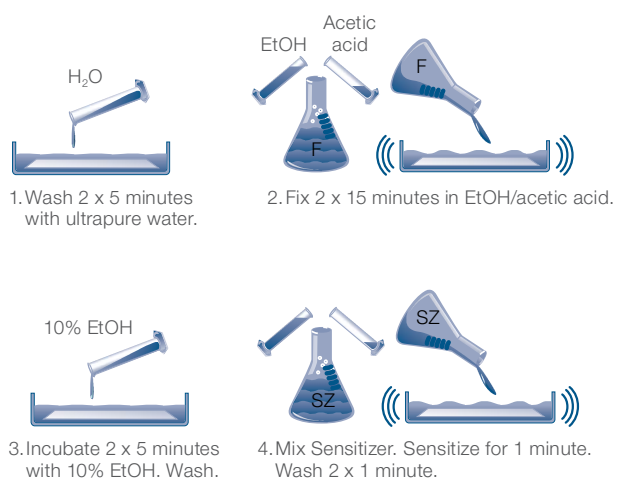


Figure 41. The Pierce Silver Stain Kit exhibits excellent sensitivity. In standard mini gels, proteins are detectable at greater than 0.25 ng per band or spot.

Figure 40. Pierce Silver Stain Kit protocol.



Product	Quantity	Cat. No.
Unstained standards		
HiMark Unstained Protein Standard	250 µL	LC5688
PageRuler Unstained Low Range Protein Ladder	2 x 250 µL	26632
PageRuler Unstained High Range Protein Ladder	2 x 250 µL	26637
PageRuler Unstained Protein Ladder	2 x 250 µL	26614
NativeMark Unstained Protein Standard	5 x 50 µL	LC0725
Prestained standards		
PageRuler Prestained Protein Ladder, 10–180 kDa	2 x 250 µL	26616
PageRuler Prestained Protein Ladder, 10–180 kDa	10 x 250 µL	26617
PageRuler Plus Prestained Protein Ladder, 10–250 kDa	2 x 250 µL	26619
PageRuler Plus Prestained Protein Ladder, 10–250 kDa	10 x 250 µL	26620
Spectra Multicolor Broad Range Protein Ladder	2 x 250 µL	26634
Spectra Multicolor Broad Range Protein Ladder	10 x 250 µL	26623
HiMark Prestained Protein Standard	250 µL	LC5699
Spectra Multicolor Low Range Protein Ladder	250 µL	26628
Spectra Multicolor High Range Protein Ladder	2 x 250 µL	26625
SeeBlue Prestained Protein Standard	500 µL	LC5625
SeeBlue Plus2 Prestained Protein Standard	500 µL	LC5925
Western standards		
iBright Prestained Protein Ladder	2 x 250 mL	LC5615
PageRuler Prestained NIR Protein Ladder	2 x 250 µL	26635
MagicMark XP Western Protein Standard	250 µL	LC5602
MagicMark XP Western Protein Standard	50 µL	LC5603
Specialty standards		
BenchMark Fluorescent Protein Standard	125 µL	LC5928
BenchMark His-Tagged Protein Standard	125 µL	LC5606
IEF Marker 3–10	500 µL	3921201
CandyCane Glycoprotein Molecular Weight Standards	400 µL	C21852
PeppermintStick Phosphoprotein Molecular Weight Standards	400 µL	P33350

Product	Quantity	Cat. No.
Coomassie stains		
PageBlue Protein Staining Solution	1 L	24620
SimplyBlue SafeStain	1 L	LC6060
SimplyBlue SafeStain	3.5 L	LC6065
Imperial Protein Stain	1 L	24615
Imperial Protein Stain	3 x 1 L	24617
Silver stains		
Pierce Silver Stain Kit	1 L	24612
SilverXpress Silver Staining Kit	1 kit	LC6100
Pierce Silver Stain for Mass Spectrometry	1 L	24600
Fluorescent and specialty stains		
SYPRO Orange Protein Gel Stain	500 µL	S6650
SYPRO Orange Protein Gel Stain	10 x 50 µL	S6651
SYPRO Red Protein Gel Stain	500 µL	S6653
SYPRO Red Protein Gel Stain	10 x 50 µL	S6654
SYPRO Ruby Protein Gel Stain	1 L	S12000
SYPRO Ruby Protein Gel Stain	200 mL	S12001
SYPRO Ruby Protein Gel Stain	5 L	S21900
Pro-Q Emerald 488 Glycoprotein Gel and Blot Stain	1 kit	P21875
Pro-Q Diamond Phosphoprotein Gel Stain	1 L	P33300
Pro-Q Diamond Phosphoprotein Gel Stain	200 mL	P33301
Pro-Q Diamond Phosphoprotein Gel Stain	5 L	P33302
No-Stain Protein Labeling Reagent	10 reactions	A44717
No-Stain Protein Labeling Reagent	40 reactions	A44449

Product	Quantity	Cat. No.
Electrophoresis chamber systems and power supplies		
Mini Gel Tank	1 unit	A25977
XCell SureLock Mini-Cell	1 unit	EI0001
SureLock Tandem Midi Gel Tank	1 each	STM1001
XCell4 SureLock Midi-Cell	1 each	WR0100
PowerEase Touch 350W Power Supply (115 VAC)	1 each	PS0350
PowerEase Touch 350W Power Supply (230 VAC)	1 each	PS0351
PowerEase Touch 120W Power Supply (115 VAC)	1 each	PS0120
PowerEase Touch 120W Power Supply (230 VAC)	1 each	PS0121