Polyacrylamide Gel Electrophoresis

Polyacrylamide gels are typically formed by polymerization of the monomer acrylamide crosslinked to the co-monomer, N,N′-methylene-bis-acrylamide, commonly called BIS. This process is a free-radical polymerization that requires an initiator, usually ammonium persulfate, and a catalyst like N,N,N′,N′-tetraethylmethylenediamine (TEMED). A distinct advantage of polyacrylamide gel systems is that by changing the initial concentrations of acrylamide and BIS, one can control the amount of crosslinking and hardness of the gel. The amount of crosslinking of a gel determines the size of the pores in the matrix, which in turn, controls the size of the molecules that can pass through the gel. So as the concentration (%) of acrylamide in the gel increases, the pore sizes in the gel get smaller and larger molecules are excluded from migrating through the gel. Typical acrylamide concentrations range from 3% to 20%. While agarose gels have large pore sizes ideal for separating DNA, RNA and large proteins, polyacrylamide gels have smaller pores that are better for separating small proteins, nucleic acids, polypeptides, and DNA fragments, ranging in size from 5 to 300 kDa .

Item #	Name	Description	Sizes
J66184	Acrylamide, **Ultra Pure**	Purity >99.9% Acrylic acid content <0.001%. Highly purified for superior gel formation for sensitive small molecule applications	100g, 500g, 1kg, 5kg
J62100	Acrylamide, 30% solution	Bisacrylamide free. A 30% (W/V) solution of ultra pure acrylamide in deionized water.	500ml, 1L
J62480	Acrylamide, 40% solution	Bisacrylamide free. A 40% (W/V) solution of ultra pure acrylamide in deionized water.	500ml, 1L

Cross-Linking Reagents

The most commonly used cross-linking reagent for polyacrylamide gel formation is N,N′-methylene-bis-acrylamide (bis-acrylamide or simply Bis). We offer a purified 99% bis-acrylamide and an Electrophoresis Grade bis-acrylamide with 99+% purity.

Item #	Name	Description	Sizes
J66174	N,N'-Methylene-bis-acrylamide, 99+%	Purity: 99+%. A purified bisacrylamide for crosslinking with acrylamide to make standard PAGE gels for most general electrophoresis applications.	25g, 100g
J66710	N,N'-Methylene-bis-acrylamide, **Electrophoresis Grade**, 99+%	Purity: 99+%. A specially purified bisacrylamide for crosslinking with acrylamide to make high resolution PAGE gels for nucleic acid electrophoresis applications.	25g, 100g,
J63265	N,N'-Methylene-bis-acrylamide, 2% Solution	A 2% solution of bis-acrylamide in specially prepared deionized water, ready to use for PAGE gel formation.	500ml, 1L

Premixed Acrylamide & Bis Powders

Item #	Name	Description	Sizes
J60486	Acrylamide/Bisacrylamide, 19:1, Powder	A premixed powder containing 19 parts acrylamide to 1 part bisacrylamide, for preparing protein PAGE gels and sequencing.	100g, 500g
J60824	Acrylamide/Bisacrylamide, 29:1, Powder	A premixed powder containing 29 parts acrylamide to 1 part bisacrylamide, for preparing sequencing gels and protein DNA gels.	100g, 500g
J61220	Acrylamide/Bisacrylamide, 37.5:1, Powder	A premixed powder containing 37.5 parts acrylamide to 1 part bisacrylamide, for preparing nucleic acid PAGE gels.	100g, 500g

Premixed Acrylamide & Bis Solutions

Item #	Name	Description	Sizes
J60126	Acrylamide/Bisacrylamide, 19:1, 30% Solution	A premixed 30% solution containing 19 parts acrylamide to 1 part bisacrylamide, ready to use for preparing protein gels	500ml, 1L
J63279	Acrylamide/Bisacrylamide, 29:1, 30% Solution	A premixed 30% solution containing 29 parts acrylamide to 1 part bisacrylamide, ready to use for preparing protein DNA gels.	500ml, 1L

Item #	Name	Description	Sizes
J61505	Acrylamide/Bisacrylamide, 37.5:1, 30% Solution	A premixed 30% solution containing 37.5 parts acrylamide to 1 part bisacrylamide, ready to use for preparing nucleic acid gels.	500ml, 1L
J60909	Acrylamide/Bisacrylamide, 19:1, 40% Solution	A premixed 40% solution containing 19 parts acrylamide to 1 part bisacrylamide, ready to use for preparing protein gels	500ml, 1L
J63079	Acrylamide/Bisacrylamide, 29:1, 40% Solution	A premixed 40% solution containing 29 parts acrylamide to 1 part bisacrylamide, ready to use for preparing protein DNA gels.	500ml, 1L
J60868	Acrylamide/Bisacrylamide, 37.5:1, 40% Solution	A premixed 40% solution containing 37.5 parts acrylamide to 1 part bisacrylamide, ready to use for preparing nucleic acid gels.	500ml, 1L

Optional Cross-Linking Reagents

Several cross-linking reagents are available that allow for reversible gel formation, so that the gel may be redissolved and the separated samples recovered. N,N′-Cystamine-bis-acrylamide is a disulfide containing cross-linker that allows the gels to be redissolved by adding a reducing agent like dithiothreitol or 2-mercaptoethanol. N,N′-Diallyltartardiamide is an allylic cross-linker whose 1,2-diol structure can be oxidized with 2% periodic acid, which solubilizes the gel and allows sample recovery. Another cross-linker with a 1,2-diol structure is N,N′-(1,2-Dihydroxyethylene)-bis-acrylamide (DHEBA). DHEBA also has two amidomethylol bonds which are base cleavable, allowing the gels to be dissolved by incubation in periodic acid and/or sodium periodate. DHEBA is very useful in gradient gels where sample recovery is desired.

Item #	Name	Description	Sizes
J66893	N,N'-Bis(acryloyl)cystamine, **Electrophoresis Grade**	A disulfide containing cross-linker. Useful cross-linker for sample recovery from the gel under physiological conditions. After electrophoresis, the cross-linked gel may be dissolved with a reducing agent like dithiothreitol or 2-mercaptoethanol.	1g, 5g, 25g
J66421	1,4-Diacroylpiperazine, **Electrophoresis Grade**	Provides increased gel strength and better separation of proteins when used in place of bisacrylamide as a cross-linking agent. Also reduces background during silver staining visualization procedures.	1g, 5g, 25g
J66587	N,N'-Diallyl-L-tartardiamide, 99%, **Electrophoresis Grade**	Excellent cross-linker for isoelectric focusing due to better mechanical stability and larger pore sizes in the gels. This allylic cross-linker contains a 1,2-diol structure which may be solubilized for sample recovery by incubating the gel in 2% periodic acid at room temperature.	50g, 250g
J66899	N,N'-(1,2-Dihydroxyethylene)-bis-acrylamide, **Electrophoresis Grade**	(DHEBA). Excellent for gradient gels where sample recovery is desired. This reversible cross-linker has a 1,2-diol structure (periodate sensitive) & two amidomethylol bonds (base cleavable). Gels with DHEBA can be redissolved in periodic acid or sodium periodate.	5g, 25g

Initiators of Polymerization

Polymerization initiators are effectors of the polymerization process enabling the gel formation. The most widely used initiator is N,N,N′N′-tetramethylethylenediamine, or TEMED, for polyacrylamide gel formation. However, a catalyst is necessary for the initiator to play its' role, and that is typically ammonium persulfate. Together, these two reagents start the entire gel formation process with acrylamide and bisacrylamide. Other polymerization accelerators are available for specific applications, such as photoinitiation of polymerization.

Item #	Name	Description	Sizes
J61856	Ammonium peroxydisulfate, **Electrophoresis Grade**	(Ammonium persulfate). Purity: 99%. A purified polymerization catalyst used with TEMED for PAGE gel formation. Ammonium persulfate also acts as a buffer between pH 8 and 9 in the gel formation process.	25g, 100g
J66058	3-(Dimethylamino)propionitrile, **Electrophoresis Grade**	(DMAPN). Purity: 98%. A polymerization accelerator that may be used in place of TEMED. DMAPN causes slower polymerization resulting in longer polymer chains, lower gel turbidity and greater elasticity.	100ml
J66672	Potassium persulfate, **Electrophoresis Grade**	(Potassium peroxysulfate). Purity: 99%. A purified polymerization catalyst used with TEMED for PAGE gel formation. Potassium persulfate is recommended for weakly basic systems with pH-9.	5g, 25g, 100g
J66632	Riboflavin, **Electrophoresis Grade**, 98%	Purity: 98%. Photoinitiator of polymerization for PAGE gels. Useful in more acidic buffer systems, with TEMED, when pH ranges from 4.0 to 7.0.	50g
J66949	Riboflavin-5-phosphate, monosodium salt, dihydrate	(Flavin mononucleotide). Purity: 98%. Photoinitiator of polymerization for PAGE gels. Useful in both acid and alkaline buffer systems.	10g, 50g
J63734	N,N,N',N'-Tetramethyl-ethylenediamine, **Electrophoresis Grade**	(TEMED). Widely used catalyst for polyacrylamide gel formation. Acts as a free radical stabilizer with ammonium persulfate to promote acrylamide polymerization.	25ml, 100ml

Detergents and Solubilizers

During electrophoresis, an important factor affecting the migration of molecules through the gel is the size and shape of the molecules. Larger molecules typically travel slower than smaller molecules, and size and shape can be a basis for separation of certain molecules. However, when analyzing molecules by size, it is convenient to analyze only linear molecules to avoid problems caused by supercoiling, single strand-double strand percentages, etc. Large molecules, like DNA and RNA, as well as large proteins and nucleic acids can have complex shapes and varying charges, affecting the rates of migration through the gels. Therefore, preparation of the samples prior to electrophoresis is of significant importance for successful separation. Detergents disrupt hydrogen bonds, uncoil DNA and RNA, denature proteins and solubilize large molecules are typically used as additives to sample solutions prior to loading the samples onto the gels. Use of the appropriate reagent can simplify electrophoresis, save time and effort, and enhance reproducibility. Alfa Aesar is pleased to offer a broad showcase of detergents and solubilizing reagents for all types of sample preparation prior to electrophoresis. The variety is endless – the choice is yours. See our complete Bio catalog for even more detergents and solubilizers, many in ready-to-use format.

Item #	Name	Description	Sizes
J66873	CHAPS, **Electrophoresis Grade**, 98+%	A zwitterionic nondenaturing detergent for solubilizing membrane proteins. Useful as a zwitterionic buffer during protein extraction.	1g, 5g
J61055	IGEPAL® CA-630	A nonionic detergent chemically equivalent to Nonidet P-40®. Useful for solubilizing membrane proteins.	100ml, 500ml
J60040	N-Lauroylsarcosine sodium salt	Purity: 95%. An anionic detergent useful in the cell lysis process of RNA purification, and for solubilizing membrane proteins prior to electrophoresis.	10g, 50g
J65509	Lithium dodecylsulfate, **Ultra Pure**	(LDS). Purity: 99%. Detergent for solubilizing proteins for electrophoresis. Demonstrates greater solubility than SDS at lower temperatures, while maintaining similar wetting ability.	10g, 50g
J67390	N-Octyl-β-D-glucopyranoside	Purity: 98+%. An important nonionic detergent used for the solubilization of membrane proteins, because it can readily be removed from final protein extracts. Improves selectivity of immunoprecipitation of phosphotyrosine modified proteins.	1g, 5g,10g
J61028	N-Octyl-β-D-thioglucopyranoside	Purity: 98+%. A nonionic detergent used for the solubilization of *E. coli* membrane proteins with no inactivation of the proteins after solubilization. More stable than N-Octyl-β-D-glucopyranoside and can easily be removed by dialysis.	2.5g, 5g, 10g
J64241	Sodium n-dodecyl sulfate, **Ultra Pure**	Purity: 99%. An anionic surfactant that denatures and solubilizes proteins for electrophoresis. Also useful as an aid in cell lysis during DNA extraction, and for dispersing and suspending nanotubes.	25g, 100g, 500g
J63394	Sodium-n- dodecyl sulfate, 20% aqueous solution	A ready-to-use 20% solution of SDS Ultra Pure for protein solubilization immediately prior to SDS-PAGE procedures.	250ml, 500ml

Reducing Agents

Disulfide linkages contribute to tertiary protein folding and play a role in the binding of many oligomeric subunits, making the proteins difficult to electrophorese. These disulfide linkages are normally reduced with a thiol in the sample buffer before electrophoresis. In addition to SDS, proteins may also be heated briefly to near boiling in the presence of a reducing agent, such as dithioerythritol (DTE), dithiothreitol (DTT) or 2-mercaptoethanol which further denatures the proteins by reducing disulfide linkages.

Item #	Name	Description	Sizes
J66291	L-(+)-Ascorbic acid, **Electrophoresis Grade**	(Vitamin C). Purity: >99%. A mild reducing agent for treatment of proteins prior to electrophoresis.	50g, 100g
J66854	L-Ascorbic acid sodium salt	(Vitamin C). Purity: 99%. A more aqueous soluble form of ascorbic acid for use as a disulfide reducing agent in proteins.	100g, 500g
J64656	1,4-Dithioerythritol, **Electrophoresis Grade**	(DTE). Purity: 99%. Quantitatively reduces disulfide bonds and maintains thiols in a reduced state.	1g, 5g, 25g
J64545	1,4-Dithio-DL-threitol, **Electrophoresis Grade**	(DTT, Clelands Reagent). Purity: 99%. Protective agent for sufhydryl groups and quantitatively reduces disulfides. Widely used reducing agent to pre-treat proteins before electrophoresis.	1g, 5g, 25g
J66742	2-Mercaptoethanol, **Electrophoresis Grade**	Purity: 98+%. A strong reducing agent that cleaves disulfide bonds and protects enzymes from catalytic site inactivation. Useful for solubilizing proteins prior to electrophoresis.	250g, 1Kg

Stains & Tracking Dyes

As proteins are mostly colorless, they are quite difficult to see in the gel, and their migration through the gel during electrophoresis cannot be easily followed. It is therefore very common to utilize stains and dyes to track the progress of proteins during electrophoresis, and to visualize them afterward. We offer dozens of additional stains and dyes in our Alfa Aesar Bio Catalog.

Item #	Name	Description	Sizes
J63797	Coomassie Brilliant Blue G soln., Ready-to-Use	(Brilliant Blue G). A general protein stain used following electrophoresis. This solution contains 30% methanol, 5% acetic acid, 0.2% Brilliant Blue G.	500ml, 1L
J61384	Coomassie Brilliant Blue R soln., Ready-to-Use	(Brilliant Blue R). A general protein stain used following electrophoresis. This solution contains 30% methanol, 5% acetic acid, 0.2% Brilliant Blue R.	500ml, 1L
J66192	Ethidium bromide, **Electrophoresis Grade**	Purity: 98%. Fluorometric stain for double-stranded nucleic acids and DNA detection. Also an RNA polymerase inhibitor.	1g, 5g
J62282	Ethidium bromide soln., 10mg/ml	Ready-to-use solution for visualization of DNA in electrophoresis. Comes in a handy dropper bottle.	10ml
J62931	Ethidium bromide de-staining bags	An easy-to-use bag with high affinity for ethidium bromide, to safely destain and absorb excess dye.	25 each
J66570	Fast Green FCF, **Electrophoresis Grade**	A general protein stain. Also for collagen and cytoplasm.	5g, 25g, 100g
J60744	Ponceau S, **Electrophoresis Grade**	(Acid Red 112). A good general protein dye that can be used to stain blotting membranes after Western blot transfer.	10g, 50g, 250g
J61068	Pyronin Y	A marker dye for RNA useful in acidic buffer systems.	1g, 5g, 10g
J62630	Stains-All, 95%	Cationic dye that stains proteins and nucleic acids. Stains different colors on bands of RNA (bluish purple), DNA (blue) and proteins (red).	1g, 5g
J66377	Xylene Cyanol FF, **Electrophoresis Grade**, dye content 70%	(Acid Blue 147). A tracking dye for DNA and nucleic acids that can be used in both agarose and polyacrylamide gels.	10g, 50g

Buffers

Buffers are used in gel electrophoresis to provide ions to carry the electrical current and to maintain the pH at a relatively constant value. Finding the optimal electrophoresis system is critical to obtaining accurate and reproducible results, and buffers are a key component to the system. Be sure to check our Bio Catalog for a complete listing of all our buffers for electrophoresis.

Item #	Name	Description	Sizes
J63615	Laemmli SDS Sample Buffer, Non-reducing (4X)	Premixed liquid 4X concentrate. Contains 250mM TRIS-HCl (pH6.8), 8% SDS, 40% glycerol, and 0.02% bromophenol blue. For protein sample preparation in the Laemmli SDS-PAGE system, without reducing the disulfide linkages.	25ml, 50ml
J60015	Laemmli SDS Sample Buffer, Reducing (4X)	Premixed liquid 4X concentrate. Contains 250mM TRIS-HCl (pH6.8), 8% SDS, 40% glycerol, 8% β-mercaptoethanol, and 0.02% bromophenol blue. For protein sample preparation in the Laemmli SDS-PAGE system. Helps to solubilize proteins by reducing the disulfide linkages.	25ml, 50ml
J63450	Stacking Buffer (4X)	Premixed liquid 4X concentrate. Contains 0.5M TRIS-HCl, 0.4% Sodium Dodecyl Sulfate, pH 6.8. Traditional stacking gel buffer for loading protein samples. Provides better resolution and sharper bands in the separating gel.	500ml, 1L
J62788	TBE Running Buffer (10X)	Premixed liquid (10X) concentrate. Contains 0.89M TRIS base, 0.89M boric acid, 20mM EDTA, pH 8.3. Widely used for electrophoresis of nucleic acids, DNA products from PCR amplification, and small DNA fragments from restriction enzymes digests. Inhibits DNA ligase which may cause problems if subsequent DNA purification and ligation steps are intended.	1L, 2L, 4L
J62914	TRIS-Glycine-Native Running Buffer (10X), pH 8.5	Premixed liquid 10X concentrate. Contains 0.25M TRIS base, 1.92M Glycine, pH 8.5. Provides excellent separation of native large molecular weight proteins on TRIS-glycine polyacrylamide gels.	1L, 2L, 4L
J61006	TRIS-Glycine-SDS Running Buffer (10X), pH 8.3	Premixed liquid 10X concentrate. Contains 0.25M TRIS base, 1.92M Glycine, 1% SDS, pH 8.3. Provides excellent separation of denatured large molecular weight proteins on TRIS-glycine polyacrylamide gels.	1L, 2L, 4L