Rigaku Reagents

Consumables for Protein Crystallization

Products designed by structural biologists for structural biologists





WZARDTM

No two proteins are alike, which is why the search through crystallization space requires examining a large number of variables. The Wizard screens were created to provide a large array of chemical combinations for researchers in order to give them the highest probability of crystallizing their proteins of interest.

Emerald BioSystems was founded in 1998 and the first products to be commercialized by the new company were the Classic Wizard screens 1 and 2. Subsequently collaboration between Emerald BioSystems and the contract research organization, Emerald BioStructures, allowed the development of new screens and an expansion of the product portfolio.

Working with structural biologists to understand their problems and processes led to the creation of new products

that made screening their targets easier and more successful. The original Wizard screens (since labeled as "Classic") are now part of a portfolio of eight Wizard screen types that enable you to utilize in your lab today, crystallization advances that have been made over the last 25 years.

Except for the Wizard pH Buffer screen, 96 well-block plate formulations are 1.7 ml each in a 96 deep-well matrix block plate. Tube sets are 10 ml volumes per tube. All formulations are prepared with ASTM type-1 water and high-purity chemicals, 0.2 µm filtered in sterile packaging.

Lance Stewart, a pioneering figure in structural biology CROs, co-founded Emerald BioStructures, Inc. and led the growth of Emerald during the discovery of eight investigational new drug molecules. Emerald's consumable product line benefited from the experience gained in these projects.



WIZARD

Classic 1, 2, 3, 4

Designed to overcome the exhaustive search for suitable protein crystallization conditions, the Wizard Classic suite of sparse matrix method screens is biased towards and selected from well-established crystallization conditions for macromolecules. Different concentrations, components and pH values are used to narrow down favorable conditions for a particular protein. Structural genomics centers worldwide use the Wizard Classic suite as initial crystallization conditions for proteins, peptides, and protein complexes.

NAME	TUBES	DEEP WELL BLOCKS
Classic 1	-	
Classic 2	•	
Classic 3	-	
Classic 4	-	
Classic 1 & 2		•
Classic 3 & 4		•

Classic Wizard 1 tubes technical sheet[†]
Classic Wizard 2 tubes technical sheet[†]
Classic Wizard 1 & 2 MSDS[†]
Classic Wizard 1 & 2 block technical sheet[†]
Classic Wizard 3 tubes technical sheet[†]
Classic Wizard 4 tubes technical sheet[†]
Classic Wizard 3 & 4 MSDS[†]
Classic Wizard 3 & 4 block technical sheet[†]

There are four different versions of the Wizard Classic to offer a wider range of formulations for initial setup. In initial setups. Wizard 2 has many of the same components as Wizard 1, just different concentrations, pHs and pairings with other components. Most users set up their trays 96 conditions at a time, so Wizard 1 and 2 make a good complement for a 96-well plate.

Wizard 3 and 4 were developed from proven, successful solutions from which others have grown crystals. In the case of Wizard 4, the screen was developed from successful hits that EmeraldBio obtained in-house from SSGCID proteins and these were cross referenced to screens 1, 2, and 3 to ensure that there was no overlap or close similarity in conditions.

WIZARD

JCSG+

Researchers from the Joint Center for Structural Genomics (JCSG) formulated this screen with the goal of maximizing the coverage of the crystallization parameter space (buffers, salts, precipitants, and pH) and eliminating redundancy. The buffers give final solution pHs between 4.2 and 10.5. Precipitants include volatile reagents such as ethanol, high molecular weight polymers such as PEG-8000, and salts such as ammonium sulfate.

NAME	TUBES	DEEP WELL BLOCKS
JCSG+		•

Wizard: JCSG+ screen technical sheet[†] Wizard: JCSG+ MSDS[†]

JCSG is a multi-institutional consortium with major activities at TSRI, GNF, UCSD, Sanford-Burnhan, and SSRL. Led by principal investigator lan Wilson, the JCGS has been instrumental in developing many new technologies and techniques that have been adopted by the general structural biology community.



WIZARD

PEG Ion

The PEG Ion series matrix combines the crystallizing power of polyethylene glycols (PEGs) with salts that are commonly found in crystallization conditions. Use PEG Ion during the coarse screening phase of biological macromolecules (proteins, nucleic acids, peptides, and combinations thereof).

NAME	TUBES	DEEP WELL BLOCKS
Peg Ion with Peg 1K & 4K		•
Peg Ion with Peg 8K & 10K		

Wizard PEG Ion MSDS[†]

Wizard PEG Ion 48 salt screen with

PEG 1K and 4K technical sheet[†] Wizard PEG Ion 48 salt screen with

PEG 8K and 10K technical sheet[†]

WIZARD

Cubic

Cubic LCP (Lipidic Cubic Phase) Kit[™] - Emerald Bio's membrane protein crystallographers designed the Wizard Cubic LCP Kit to enable researchers to prepare LCP-type crystallizations by hand. Suitable for low-protein quantities, down to sub-mg amounts, the LCP technique has become the workhorse for crystallization of 7TM membrane proteins. The kit contains all tools to prepare membrane protein crystallization experiments using the LCP approach. Wizard Cubic LCP screen is a random sparse matrix designed for the crystallization of biological macromolecules that are embedded within a lipidic cubic phase LCP host matrix. Every formulation in this 96-well block plate is compatible with monoolein-based lipidic cubic phases.

NAME	TUBES	DEEP WELL BLOCKS
Cubic LCP Kit		
Cubic LCP screen		

Wizard Cubic LCP block technical sheet[†] Wizard Cubic LCP MSDS[†] Wizard Cubic LCP Kit instruction sheet[†]

WIZARD

TIME

Membrane proteins require detergent solubilization for purification and crystallization. The choice of the proper detergent is typically restricted to a low number of readily available detergents and hence extraction experiments are often carried out sequentially. FSEC-fluorescence size exclusion chromatography has proven to be a useful tool in characterizing the extraction yield and behavior in detergent solution of fluorescently labeled membrane proteins. The Wizard TIME is a detergent kit consisting of 84 different formulations, and its utility is in identifying those detergent reagents that successfully extract a membrane protein from a membrane preparation. Each detergent formulation consists of a detergent at 2% (w/v) concentration, the stabilizing co-detergent cholesterol hemisuccinate and a buffer.

NAME	TUBES	DEEP WELL BLOCKS
TIME		

Wizard TIME screen technical sheet[†] Wizard TIME instruction sheet[†]

WIZARD **Precipitant Synergy**

Use of this screen is advised for protein targets that have failed to yield hits with traditional random sparse matrix crystallization approaches.

The Wizard Precipitant Synergy protein crystallization screen targets all types of soluble protein and protein complexes. Tests have shown that this screen can triple the number of unique crystals when compared with other screens¹. Each unique formulation is made available in three different concentrations, increasing the coverage of crystallization space. These related formulations are positioned in neighboring wells or tubes, simplifying the analysis of crystallization behavior. This format uses $2 \times 96 = 192$ formulations in two crystallization plates for initial protein crystallization screening and crystallization optimization.

- Compatible with 96-well format crystallization platform and processes.
- Simple evaluation of crystallization results by comparing adjacent wells.
- Absolutely unique crystallization conditions no overlap with any other protein crystallization screen.

NAME	TUBES	DEEP WELL BLOCKS
Precipitant Synergy		•

Wizard Precipitant Synergy MSDS[†] Wizard Precipitant Synergy tubes technical sheet[†] Wizard Precipitant Synergy block technical sheet[†]

WIZARD

Cryo 1 & 2

The Wizard Cryo™ line of random sparse matrix screens is designed for scientists who want to avoid the additional step of optimizing a cryoprotectant condition. Every Wizard Cryo formulation flash-freezes to a clear, amorphous glass in liquid nitrogen or in a cryo-stream at 100K. Crystals can be frozen directly from their growth drops, avoiding the additional step of pre-equilibration with an artificial cryo-condition that can damage the crystal. Eleven different cryocrystallants and sparing use of glycerol ensures a broad sampling of possible cryo-conditions. Choose from Wizard Cryo 1 or 2 formulations in tubes or Wizard Cryo 1 and 2 together in a 96-well matrix block.

NAME	TUBES	DEEP WELL BLOCKS
Cryo 1		
Cryo 2		

Wizard Cryo 1 tubes technical sheet[†] Wizard Cryo 2 tubes technical sheet[†] Wizard Cryo 1 & 2 block technical sheet[†] Wizard Cryo 1 & 2 MSDS[†]

WIZARD pH Buffer

The Wizard pH Buffer screen is an optimization screen that can be applied to your crystallization hit optimization to simultaneously explore the effects of pH and buffer composition on crystal growth. The Wizard pH Buffer matrix is a set of 96 unique buffer solutions encompassing 12 unique buffer systems at 8 pH points, incrementally varied by 0.4 pH units.

96-well block plate formulations are 1.0 ml each in a 96 deep-well matrix block plate. All formulations are prepared with ASTM type-1 water and high-purity chemicals, 0.2 μm filtered in sterile packaging.

NAME	TUBES	DEEP WELL BLOCKS
pH Buffer		

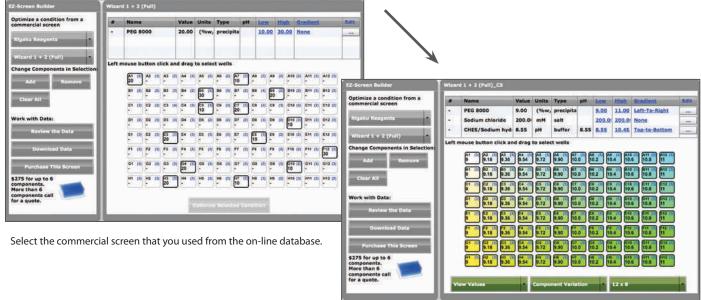
pH Buffer screen technical sheet[†]

¹ Majeed, S., Ofek, G., Belachew, A., Huang, C.C., Zhou, T., Kwong, P.D. (2003) Enhancing protein crystallization through precipitant synergy. Structure, 11: 1-20.



When you get a hit on a commercial screen, why spend time calculating the optimization?





Select the cell from the screen that you wish to optimize around, and selection the optimization parameters.

Receive a 96 deep-well block by express delivery



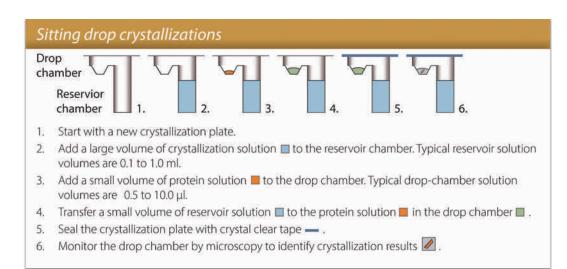
If you work in the US, your optimization screen can be delivered by express courier the next day.

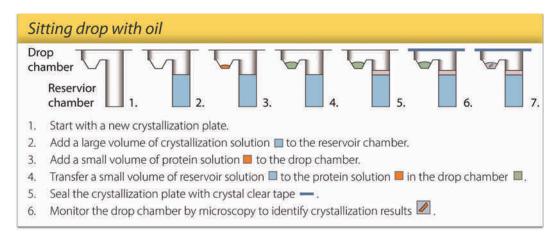
Instructions for using the Wizard series of sparse matrix screens

Instructions for use

The Wizard Classic screens are intended primarily for use in vapor diffusion crystallizations of biological macromolecules^{2, 3, 4}. Before setting up crystallization trials, the biological macromolecule sample should be as highly purified as possible, appearing >97% pure by silver-stained SDS-PAGE. The sample should be in as minimal a buffer as possible to maintain the biological activity of the biomolecule, and at a biomolecule concentration of 5-15 mg/ml.

There are several methods used for protein crystal growth trials. A few of the most popular are shown on these two pages. If the supply of sample permits, it is recommended that crystallizations be set up in duplicate, with one setup placed at room temperature and the other one at 4°C. Regardless of the crystallization method used, the crystallization trials should be stored in a place free of vibrations or mechanical shock, which could result in premature precipitation.





² Gilliland, G. L. & Davies, D. R. (1984) *Methods in Enzymol.* **104**, 370-381.



You can manually set up or use an automate



You can manually view the pr a microscope or use an automa



Advantages of an automated ima Minstrel™ DT UV shown above, inclu recording into a database, and rem

³ McPherson, A. (1990) Eur. J. Biochem. 189, 1-23.

⁴ Weber, P. C. (1991) Adv. in Prot. Chem. **41**, 1-36.



your crystallization plate d robot if available.



ogress of crystallization using ted imaging system if available.



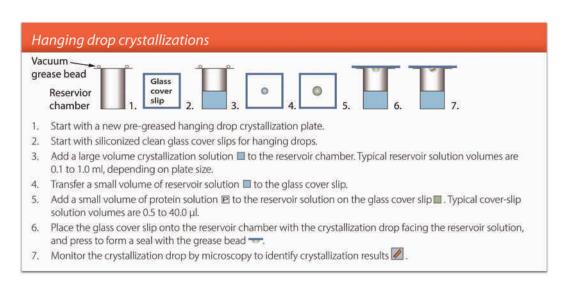
iging system, such as the Rigaku de automatic scheduling of imaging, ote viewing outside of a cold room.

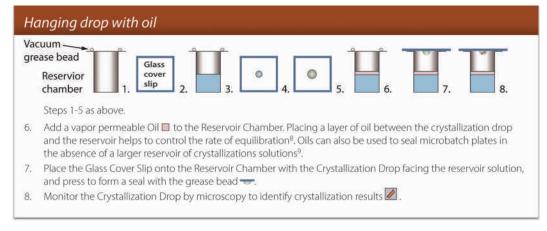
Interpretation of results

You should record observations of crystallization trials every one or two days. The crystallization trials can be viewed with a stereomicroscope at 10-100x magnification or using an automated imaging system such as the Rigaku Minstrel DT. Record observations for every condition, even if the crystallization drop remains clear. This should be done either manually or in the case of the Minstrel DT, the observations are made and stored automatically. If less than 10% of the conditions in the crystallization screen do not show heavy precipitate after one day, consider increasing the biomolecule concentration of the sample. If more than 50% of the conditions in the crystallization screen show heavy precipitate after one day, consider reducing the biomolecule concentration.

Optimization

If small crystals, or crystals that do not grow robustly in all three dimensions (needles and plates), are obtained in an initial screen, the crystallization may be optimized by adjusting the various parameters including: concentrations of salts and precipitants, pH, biomolecule concentration, use of additives, and temperature. Small crystals can be grown larger by seeding techniques^{5, 6}. Using larger volume crystallization drops may also increase crystal size⁷.





⁵ Thaller, C. et al. (1985) *Methods in Enzymol.* **114**, 132-135.

⁶ Stura, E. A. & Wilson, I. A. (1990) METHODS: A Companion to Methods in Enzymol. 1, 38-49.

⁷ Fox, K. M. & Karplus, P. A. (1993) *J. Mol. Biol.* **234**, 502-507.

⁸ Chayen, N. E. (1997) J. Appl. Cryst. 30, 198-202.

⁹ Chayen, N. E. et al. (1990) J. Appl. Cryst. 23, 297-302.

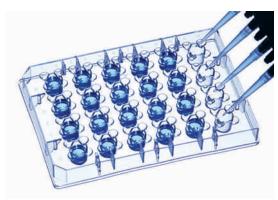
Crystallization plates

Our CombiClover crystallization plates utilize a patented sitting-drop well design. A central reservoir is connected to four satellite drop chambers via dedicated vapor diffusion channels to create a novel combinatorial "crystallization clover". The unique design allows four different crystallization experiments to occur within each clover, providing maximum efficacy and conservation of crystallization solutions.

CombiClover 500

The CombiClover 500 has 24 of the described clovers. providing 96 flat-bottom sitting drop chambers.

- Plate dimensions are 85.5 mm x 127.8 mm x 14.4 mm
- Plates are compatible with SBS standard laboratory automated instrumentation
- Drop chambers are 9 mm apart and reservoir chambers are 18 mm apart in both horizontal and vertical directions for easy use with multi-channel pipettes
- The central reservoir volume is 500 microliters
- The satellite drop chamber volume is 10 microliters

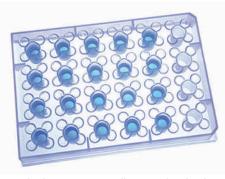


The CombiClover 500 crystallization plate has 24 solution reservoirs and 96 sitting drop chambers.

CombiClover 1500

The CombiClover 1500 crystallization plates offer the exact same design and utility as the CombiClover 500 crystallization plates, but offer larger capacity in the reservoir and drop chambers.

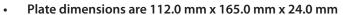
- Plate dimensions are 112.0 mm x 165.0 mm x 24.0 mm
- The central reservoir volume is 1.5 milliliters
- The satellite drop chamber volume is 50 microliters

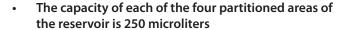


The CombiClover 1500 crystallization plate has larger capacity reservoir and drop chambers.

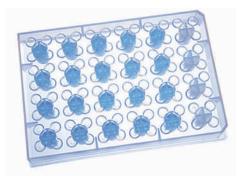
CombiClover 4 Chamber

The CombiClover 4 Chamber crystallization plate utilizes four partitioned reservoir chambers in the place of one central reservoir. These four partitioned chambers are each connected to a satellite drop chamber via dedicated vapor diffusion channels to create a variation of "crystallization clover". Each plate has 24 of the partitioned reservoirs and 96 flat-bottom sitting drop chambers. This design allows four different experiments to be conducted in each clover and allows them to be investigated simultaneously.





The satellite drop chamber volume is 50 microliters

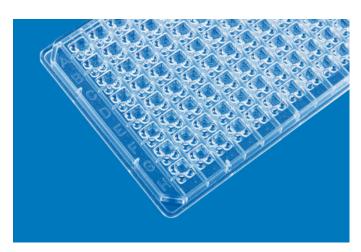


The CombiClover 4 Chamber crystallization plate has 96 solution reservoirs and 96 sitting drop chambers.

Rigaku UV+ plate

The Rigaku UV+ plate is a low profile plate with excellent visible and UV imaging characteristics. Low profile plates provide a significant advantage when used in conjunction with Rigaku's Gallery™ incubators by allowing over 1/3 greater plate storage capacity compared to standard height SBS plates. Other features include:

- Low background fluorescence material
- L-shaped 3-well layout
- Shallow wells for the ease of harvesting
- Concave wells for precise drop-on-drop dispensing
- Wide separation between wells for reliable tape sealing
- Standard 96-well SBS profile
- Drop sizes from 50 nl to 5 µl
- Reservoir volumes: 20 µl to 40 µl



The Rigaku UV+ plate is a low profile plate with excellent visible and UV imaging characteristics.

CrystalMation™ Inteli-Plate

The CrystalMation Intelli-Plate is designed for visible imaging experiments. With its low profile SBS format the CrystalMation plate allows you to maximize the number of plates you can place into Rigaku's Gallery incubators. The low-profile crystallization plate is designed for sitting drop vapor diffusion crystallization experiments and is constructed from optically clear, chemically resistant plastic with superior low birefringence.

- Low profile plate (7.8 mm high)
- 288-well with 96 reservoirs in standard SBS format with three subwells arranged in linear fashion
- 1 μl well volume and 100 μl reservoir volume

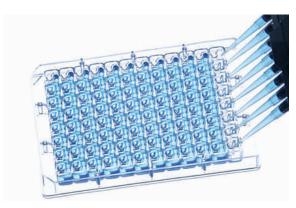


The CrystalMation Inteli-Plate.

Compact 300

The Compact 300 crystallization plate utilizes our patented sitting drop well design and vapor diffusion channel. This plate has 96 reservoirs with 96 drop chambers.

- Plate dimensions are 85.5 mm x 127.8 mm x 14.4 mm
- Plates are compatible with SBS standard laboratory automated instrumentation
- Drop chambers are 9 mm apart in both horizontal and vertical directions for easy use with multi-channel pipettes
- The reservoir volume is 300 microliters
- The drop chamber volume is 6 microliters



The Compact 300 crystallization plate.

In support of crystallization

Our patented BirdFeeder™ technology, used in Rigaku's Alchemist™ line of screen makers, provides self-contained liquid dispensing and individual stock solution management, with barcode tracking, individual syringes that eliminate cross contamination, and integral long-term storage, all in one revolutionary design that allows for direct dispensing into VDX™, Linbro® or Nextal® plate

formats. Our BirdFeeder technology eliminates the need for tubing, which means no waste of expensive chemicals such as detergents. Due to the non-contact automated dispensing of our Alchemist and a single, dedicated Eppendorf syringe for each stock solution, cross contamination is eliminated.

The BirdFeeders are available in three different models. The small BirdFeeder uses a 0.1 ml syringe, the medium BirdFeeder uses a 1.0 ml syringe, and the large BirdFeeder uses a 10.0 ml syringe. Any BirdFeeder can be fitted with either a 125 ml or 250 ml Nalgene® bottle, or alternatively, 20 ml of solution can be stored in a BirdFeeder with a screw cap covering the bottle hole.



Rigaku's BirdFeeder technology provides self-contained liquid dispensing and individual stock solution management for use with our Alchemist line of liquid handling robots.

Stock solutions

Use our stock solutions directly or as a component in solutions you create in your own lab. We prepare our stock solutions using high quality raw materials, ASTM Type 1 water, and sterile packaging. Our stock solutions are intended for research and development use only.

Stock solutions can be ordered individually in various quantities and customs solutions and screens can also be ordered.

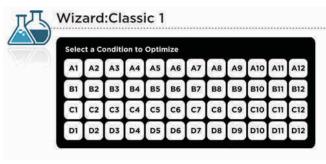


HT solution starter kit. This kit provides thirty-two of the most commonly used solutions at 100 ml volumes.

Did you get a hit using a Wizard or Cryo screen? If so, optimize with the formulations found in each screen.

Available for Wizard Classics 1, 2, 3 and 4 as well as Wizard Cryo 1 and 2, you can select the well you observed a crystal and purchase the reagents to optimize around those conditions.

VDX is a trademark of Hampton Research Linbro is a registered trademark of Linbro Scientific, Inc. NEXTAL is a registered trademark of QIAGEN GmbH LTD Nalgene is a registered trademark of NALGE Company Corporation



The RigakuReagents.com website contains an interface for selecting the well of interest in the screen of interest and then purchasing the components of that well.

Crystallization hardware from Rigaku

Rigaku offers a full range of crystallization hardware to support the needs of any structural biology laboratory. The individual lab, the desk top series of products (Alchemist DT, Minstrel DT, Winstrel DT UV, and Gallery DT) provides a well-tested set of hardware for improving reproducibility and throughput in your lab. For labs that support multiple PIs, the high-throughput line of products (Alchemist HT, Minstrel HT, Minstrel HT UV, and Gallery HT) provides the extra capacity and temperature control that you need. The Crystal Mation system combines the high-throughput products with other modules to create a completely standalone crystallization platform that will take you from protein and solutions to crystals.

Alchemist DT and HT

Screen preparation is not only tedious, time consuming and potentially error prone, but the accuracy with which a screen design can explore the high dimensional chemical space determines whether a crystallization experiment leads to a hit. The Alchemist simplifies fine and coarse screen production with unmatched accuracy using patented "Tapper" technology, no cross contamination and no waste with patented BirdFeeders, and fast and simple screen optimizations with the CrystalTrak[™] software package.

The Minstrel imaging series

During a protein crystallization screening process, literally thousands of experiments have to be carried out to find favorable crystallization conditions. Rigaku offers two different imaging systems to help with evaluation of the screening experiments. The Minstrel imagers are designed to simplify the inspection and management of experimental plates during a protein crystallization experiment.

The desktop Minstrel product line includes two models, Minstrel DT and Minstrel DT UV, for visible light only and combined visible light/UV imaging respectively. Either model can be equipped with a plate hotel for storage and automatic scheduling of imaging.

The high-throughput Minstrel imagers, Minstrel HT and Minstrel HT UV, are also available with or without UV imaging. Each high-throughput Minstrel imager can be fitted with one or two incubators so that experiments can be more easily controlled with respect to temperature. Incorporating two incubators with a Minstrel HT imager makes it easy to set up crystallization plates at two different temperatures.



The Alchemist DT has room for 26 solutions on the deck at one time.



The Minstrel DT UV with the Gallery DT, a storage system with capacity for up to 222 low profile SBS plates.



The Minstrel HT UV with two Gallery HT incubators, capable of storing plates at two different temperatures.

Rigaku Reagents

Consumables for Protein Crystallization

www.RigakuReagents.com



Rigaku Corporation and its Global Subsidiaries

website: www.Rigaku.com | email: info@Rigaku.com

Our Vision of the Future

With the acquisition of Emerald Bio's consumable business and the launch of Rigaku Reagents, our customers have quick and ready access to a wide range of unique and popular brands, customized screens, solutions and plates. In conjunction with our already strong reputation for instrumentation, Rigaku provides a consolidated point of contact for many of your laboratory needs.

Rigaku Reagents is committed to providing high quality consumables that are readily accessible and meet the trends of our industry. In addition, we offer customized features that can be tailored to fit your unique targets and workflows. We will continue to expand our product offerings and services, while enhancing your order experiences for years to come.



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