X-CLARITY™
SYSTEMS AND REAGENTS FOR TISSUE CLEARING
www.logosbio.com
**SECTIONING IS TIME. WE CUT THE TIME.**

Tissues are inherently three-dimensional in nature, which makes imaging intact tissues a necessity for a more complete study into the relationship between structure and function and the system-level study of cellular mechanisms. Tissue clearing has become an important step for imaging tissues in 3D at single-cell resolution.

The X-CLARITY™ is a collection of systems and ready-to-use reagents to standardize, simplify, and accelerate each step of the tissue clearing process. X-CLARITY™ is based on the CLARITY (Clear Lipid-exchanged Acrylamide-hybridized Rigid Imaging / Immunostaining / in situ-hybridization-compatible Tissue Hydrogel) method. With CLARITY, preserved tissues are embedded in a hydrogel matrix and lipids are actively extracted through electrophoresis to create a stable and optically transparent tissue-hydrogel hybrid that is chemically accessible for multiple rounds of antibody labeling and imaging.

**ACCELERATE YOUR 3D IMAGING WORKFLOW**

**STEP 1**
Tissue-hydrogel Hybridization

A fixed tissue sample is incubated in the X-CLARITY™ Hydrogel Solution Kit to allow hydrogel monomers to diffuse uniformly throughout the sample. Once the solution has permeated the tissue, the sample is placed in the X-CLARITY™ Polymerization System. Monomers polymerize in the anaerobic environment, linking the biomolecules to a hydrogel network, which preserves molecular information and structural integrity.

**STEP 2**
Tissue Clearing

Once the tissue-hydrogel hybrid has been formed, the hybrid is cleared in the X-CLARITY™ Tissue Clearing System II using the ready-to-use Electrophoretic Tissue Clearing Solution. Lipids are extracted actively through electrophoresis or passively, leaving behind a stable and transparent tissue-hydrogel hybrid that is chemically accessible for molecular phenotyping.

**STEP 3**
Antibody Labeling

The transparent sample is then labeled with antibodies using the DeepLabel™ Antibody Staining Kit, which enhances antibody penetration into clarified tissues. Optimized for clarified tissue samples, DeepLabel™ can be used with tissues cleared with various clearing methods such as passive or active CLARITY, iDISCO, 3DISCO, uDISCO, Visikol, or CUBIC.

**STEP 4**
Imaging

Prior to imaging, the tissue-hydrogel hybrid is placed in X-CLARITY™ Mounting Solution, a refractive index matching solution (RIMS), to homogenize the environment within the tissue to the solution. This reduces light scatter, which in turn increases optical transparency and consequently increases image quality and imaging depth.
X-CLARITY™ Hydrogel Solution Kit

The X-CLARITY™ Hydrogel Solution Kit is a pre-tested hydrogel solution for uniform and consistent tissue-hydrogel hybridization. The kit is composed of X-CLARITY™ Hydrogel Solution and X-CLARITY™ Polymerization Initiator.

**X-CLARITY™ Hydrogel Solution**

[C13103 – 1 x 1L]

The X-CLARITY™ Hydrogel Solution is a ready-to-use acrylamide-based solution used to create polyacrylamide. X-CLARITY™ Hydrogel Solution contains no bis-acrylamide or paraformaldehyde.

**X-CLARITY™ Polymerization Initiator**

[C13104 – 1 x 2.5 g]

The X-CLARITY™ Polymerization Initiator is a thermal free radical initiator that releases free radicals when heated in solution to initiate the polymerization of hydrogel monomers.

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X-CLARITY™ Polymerization System

The X-CLARITY™ Polymerization System is a standalone, automated system developed to simplify tissue-hydrogel hybridization, a crucial step for optimal tissue clearing. Multiple samples can be placed in multi-well plates or conical tubes for rapid and efficient high-throughput sample processing. Users can control polymerization by adjusting vacuum strength, temperature, and a timer through a simple touchscreen interface.

**Comes with your choice of two heat blocks**

<table>
<thead>
<tr>
<th>X-CLARITY™ Heat Block for 6 x 50 mL tubes</th>
<th>C20004</th>
</tr>
</thead>
<tbody>
<tr>
<td>92 x 134 x 75 mm / 1.9 kg</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>X-CLARITY™ Heat Block for flat-bottom plates</th>
<th>C20003</th>
</tr>
</thead>
<tbody>
<tr>
<td>92 x 134 x 78 mm / 2.5 kg</td>
<td></td>
</tr>
</tbody>
</table>

**X-CLARITY™ Polymerization System Specifications**

- **Display**: 5” TFT LCD
- **Temperature Range**: RT - 60°C
- **Temperature Accuracy**: ±0.3°C
- **Vacuum Range**: -90 to -1 kPa
- **Power Consumption**: 312 W
- **Applicable Pressure**: AC 100-240V, 50/60 Hz
- **Dimensions**: Exterior: 332 x 430 x 222 mm, Interior: 307 x 137 x 140 mm
- **Weight**: 28 kg

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**High throughput (up to 768 samples/run)**

**Compatible with various vessels**

**Fully automated vacuum and temperature control**

**Rapid and consistent polymerization**

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**Touchscreen Interface**: The simple touchscreen interface gives users precise control over vacuum pressure, temperature, and polymerization time.

**Compatible with multwell plates and conical tubes**: Users can select the combination of heat blocks to use with the system.
The X-CLARITY™ Tissue Clearing System II is an all-in-one, easy-to-use solution for electrophoretic tissue clearing. Its unique design accelerates the removal of lipids from tissues while preserving the structural integrity of the sample.

Users can set tissue clearing conditions through a simple and intuitive touchscreen interface. In ETC (electrophoretic tissue clearing) mode, platinum-plated electrodes generate an electric field to accelerate the removal of lipids from tissues in a highly efficient manner. A built-in temperature control system actively cools and heats buffer to maintain consistent buffer temperatures during clearing. Buffer is constantly circulated to ensure consistent buffering capacity, temperature control, and elimination of tissue clearing byproducts. This advanced system ensures efficient, rapid, and consistent tissue clearing.

- **Precise temperature control**
  - Active buffer cooling and heating capacity
  - Sensitive and accurate temperature sensor

- **Uniform electric field**
  - Platinum-plated electrodes
  - Constant current and constant voltage modes

- **Compatible with multiple tissue types and sizes**
  - Electrophoretic and passive clearing
  - Holders of various sizes available

- **User-friendly setup**
  - Simple touchscreen interface
  - Ready-to-use clearing solution

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### X-CLARITY™ ETC Chamber Specifications

<table>
<thead>
<tr>
<th>Instrument type</th>
<th>External dimensions (W x D x H)</th>
<th>Internal dimensions (W x D x H)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrophoretic chamber</td>
<td>176 mm x 128 mm x 154 mm</td>
<td>57 mm x 30 mm x 93 mm</td>
<td>2.8 kg</td>
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</table>

### X-CLARITY™ ETC Control Tower Specifications

<table>
<thead>
<tr>
<th>Instrument type</th>
<th>Power supply, temperature control, and buffer circulation device</th>
</tr>
</thead>
<tbody>
<tr>
<td>User interface</td>
<td>5 inch TFT LCD touchscreen</td>
</tr>
<tr>
<td>Power supply modes</td>
<td>Constant current or constant voltage</td>
</tr>
<tr>
<td>Current &amp; voltage range</td>
<td>0.2-1.5 A, 5-70 V</td>
</tr>
<tr>
<td>Temperature range</td>
<td>30-60°C</td>
</tr>
<tr>
<td>Pump speed range</td>
<td>50-200 rpm</td>
</tr>
<tr>
<td>Electrical requirements</td>
<td>AC 100-240V, 50/60 Hz</td>
</tr>
<tr>
<td>Power consumption</td>
<td>100 W (including the X-CLARITY™ ETC Chamber)</td>
</tr>
<tr>
<td>Dimensions (W x D x H)</td>
<td>205 mm x 430 mm x 370 mm</td>
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<tr>
<td>Weight</td>
<td>20 kg</td>
</tr>
</tbody>
</table>

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### Compatible sample holders

- **Container for 1 Tissue Container**
  - C12001

- **Tissue Container**
  - C12002

- **Mouse Brain Slice Holder**
  - C12003

- **Whole Rat Brain Holder**
  - C12004

- **Holder for 6 Slices**
  - C12010

- **Holder or 1 Sample**
  - C12011

- **Holder for 6 Mouse Brains**
  - C12012

- **Holder for 48 Samples**
  - C12013

- **Holder for 192 Samples**
  - C12014
Long-term preservation of the Thy1-YFP signal in tissues cleared with the X-CLARITY™ systems and reagents. (A) Thy1-YFP signal immediately after clearing. (B) Thy1-YFP signal one month after clearing.

Thy1-YFP mouse brain slices cleared with the X-CLARITY™ systems and reagents. Thy1-YFP (green), Anti-Collagen IV (red), TO-PRO-3 (blue).

Rapid, consistent, and reproducible clearing for thick tissues

Verified with multiple tissue types

Mouse lungs and trachea cleared with the X-CLARITY™

Mouse outer ear cleared with the X-CLARITY™

Mouse spinal cord cleared with the X-CLARITY™

Mouse heart cleared with the X-CLARITY™

Mouse liver cleared with the X-CLARITY™

Arabidopsis thaliana Cleared with the X-CLARITY™
DeepLabel™ Antibody Staining Kit

DeepLabel™ Antibody Staining Kit is a set of non-toxic, ready-to-use reagents optimized for use with clarified tissues for effective antibody penetration and site-specific binding. With DeepLabel™, macromolecular probes rapidly and efficiently penetrate thick, protein-dense tissues at lower antibody concentrations. DeepLabel™ facilitates homogenous antibody staining with 2.6 X greater signal-to-background than conventional staining methods. DeepLabel™ is compatible with virtually all antibodies and all tissue clearing methods including CLARITY, PACT, iDISCO, and CUBIC.

- Homogenous antibody distribution
- Site-specific labeling
- 2.6 X greater signal-to-background
- Vibrant imaging at subcellular resolution
- Simple protocol with ready-to-use reagents
- Compatible with multiple clearing methods

DeepLabel™ Solution A  
DeepLabel™ Solution B  
DeepLabel™ Washing Buffer  
X-CLARITY™ Mounting Solution

DeepLabel™ enhances anti-Collagen IV penetration into clarified mouse brain tissues.
X-CLARITY™ Mounting Solution is a refractive index matching solution (RIMS). The RI of the solution is 1.460 at 25°C and is stable over a wide temperature range. X-CLARITY™ Mounting Solution minimizes photobleaching and preserves fluorescence signals, making it an ideal solution for mounting clarified and labeled tissue samples.

- RI = 1.460 at 25°C
- Minimizes photobleaching
- Preserves fluorescence signals

X-CLARITY™ cleared tissues are compatible for imaging with the following imaging systems:

- Zeiss Lightsheet Z1
- OpenSPIM
- Lavision Ultramicroscope
- Confocal microscope (inverted)
- Confocal microscope (upright)

<table>
<thead>
<tr>
<th>Refractive Index (value±0.001)</th>
<th>Temperature</th>
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<tbody>
<tr>
<td>1.461</td>
<td>20°C</td>
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<tr>
<td>1.460</td>
<td>25°C</td>
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<tr>
<td>1.459</td>
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<tr>
<td>1.453</td>
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<tr>
<td>1.451</td>
<td>60°C</td>
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</tbody>
</table>
Pisa, Italy

"The X-CLARITY has actually been fundamental to the Data Brain Project because without being able to clear tissues ... we wouldn't be able to extract that structural information that is so important to understand the function of mammalian brains. It's been a huge advantage and a great leap forward in imaging."

Arti Ahluwalia, PhD
Director, Centro E. Piaggio

Paris, France

"The X-CLARITY allows us to perform rapid, efficient, and standardized clearing of mouse and human brain tissues. Access to the X-CLARITY technology will undoubtedly help the ICM research teams to better understand the 3D organization of protein assemblies and organelles in tissues."

Annick Prigent and Benoît Delatour, PhD
Operational Manager and Scientific Manager, ICM Histomics

Cambridge, MA, USA

"We purchased the X-CLARITY for our facility and have been very satisfied with its easy-to-use design and consistent results. The X-CLARITY Tissue Clearing System has now allowed many more researchers to enter the field of tissue clearing."

Doug Richardson, PhD
Director, Harvard Center for Biological Imaging

San Diego, CA, USA

"The X-CLARITY system is a delight to use and significantly lowers the barrier to tissue clearing imaging applications. With better clearing, and faster turnaround time, we were able to generate many more samples and images than would otherwise have been possible. Highly recommended!"

Uri Manor, PhD
Director, Salk Institute for Biological Studies Biophotonics Core

Lyon, France

"Thanks to X-CLARITY, we now have access to the three dimensions of the whole heart organ."

Gabriel Bidaux, PhD
Principal Investigator, INSERM

Lausanne, Switzerland

"The X-CLARITY saves a lot of time. We were able to image an entire set of brain and spinal cords in a relatively short amount of time. This allowed us to clearly see the benefit of the approaches we're having on spinal cord networks following an injury. It's a great device to save time for your research."

Quentin Barraud, PhD
Lab Manager & Scientific Coordinator, EPFL