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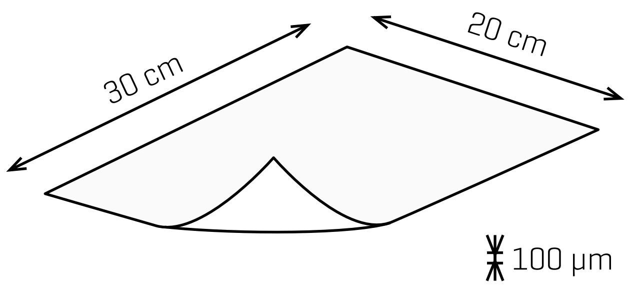
SOLARONIX

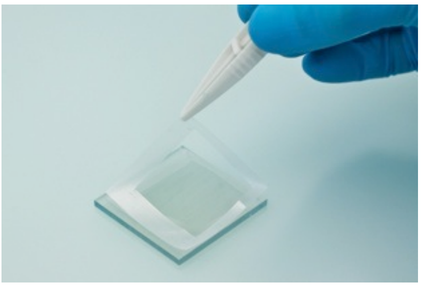
Meltonix 1170-100

Hot Melt Sealing Film with Protective Foil



Meltonix 1170-100 is a 100 micron thick hot melt sealing film suitable for laminating Dye Solar Cell electrodes and closing filling holes, by applying heat and pressure.

The material chosen for Meltonix 1170-100 is chemically compatible with most electrolyte compositions. It ensures a robust confinement of the electrolyte, even in extreme operating conditions.



Characteristics

Sealing Agent	DuPont Surlyn®
Film Thickness	100 µm
Sealing Temperature	~100 °C
Protective Foil	none
HS Code	3919.9000

Protected or Non-Protected Sealing Film

Meltonix 1170-100 does not come with any protective foil.

In the opposite, its equivalent Meltonix 1170-100PF comes with a protective foil on one side. This foil is comparable to the additional film that comes with most popular brands of double-stick tape. It lets the user conveniently apply the tape one sticky side at a time. Meltonix 1170-100PF is used the same way except that it only adheres when heat is applied. With the protective foil, the lamination is completed in two easy steps.

References

30 x 20 cm	ref. 42932
30 x 20 cm, 10 pcs.	ref. 42910

Pricing on product page:
solx.ch/meltonix100

How to Order

Please visit our webshop at shop.solaronix.com, or send us an e-mail or fax indicating your desired products.

Bulk Supply

In addition to the retail quantities listed above, Meltonix 1170-100 is also available in bulk for industrial purpose. Inquiries are welcome.

USAGE

Meltonix 1170-100 is a 100 micron thick hot-melt film specifically suitable for sealing glass electrodes. It is supplied in sheets from which virtually any shape of gasket can be cut out. Such a gasket is then laminated between two glass substrates by applying heat an pressure.

The resulting stack leaves an internal pocket in which a liquid electrolyte can be hosted. The interstice between the electrodes is slightly inferior to 100 microns after processing.

Sealing Dye Solar Cell Electrodes

Cut out a sealing gasket from a sheet of Meltonix 1170-100. The inner dimensions should correspond to, or be slightly larger than, the active area of the cell to be laminated, but not smaller. The outer dimensions should be 2-3 mm larger on all sides in order to ensure a good confinement of the electrolyte. Make sure the overall size of the gasket leaves room for electrical contacts on the electrodes after sealing. Watch out for wrinkles, defects, and debris.

For solar modules (several cells interconnected on the same substrate), we recommend 1-2 mm of gasket between the cells, and at least 2-3 mm on the outer perimeter of the module.

Position the gasket on the conducting side of the anode so that it matches up with the active area. There should be one or more edges of the electrode that are not covered by the gasket to leave room for electrical contacts.

Place the counter-electrode, conductive side facing down, on top of the gasket to form a glass sandwich. Consider shifting slightly the two electrodes to leave room for electrical connections.

Apply heat and pressure with the help of a hot press or a similar tool set at 110°C. A domestic iron set to synthetic fabric can be advantageously turned into a hot press for small works. After about ten seconds, the hot-melt material should seal the electrodes together. If not, repeat this operation until the whole surface of the gasket has melted onto both electrodes.

Be careful not to apply too much pressure. This can cause the gasket to spread out, resulting in uneven gasket thickness.

A good adhesion of the sealing film to the glass plates can be confirmed by a careful visual examination. The hot-melt material should match the refractive index of the glass and look very transparent all over the gasket surface.

The degradation of finished Dye Solar Cell is typically due to leaks from imperfect sealing. Temperature and pressure adjustments may be necessary to find the optimal conditions for your setup.

Remember that stained titania electrodes are sensitive to air, light, and hight temperature when the electrolyte is not present. Even when the electrodes are sealed, air can still enter the cell thought the electrolyte filling holes. To avoid degradation of the cell proceed directly to electrolyte filling if required.

Sealing Electrolyte Filling Holes

Electrolyte filling holes can be sealed in a similar fashion, by laminating a glass disc onto the hole on the external side of the electrode. The process is similar to the procedure explained above.

First, cut out a piece of Meltonix 1170-100 the size of the glass circle or bigger. Position the piece of Meltonix 1170-100 over the hole, and center the glass disk on top of it.

Apply heat and pressure for a few seconds to adhere the Meltonix to the glass surfaces. The hole is now sealed.

Gently nudge the sealed glass disc with a sharp tool, the disc shouldn't pop out too easily when the hole is properly sealed.

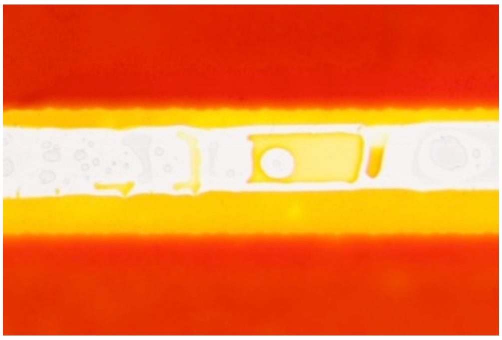
Common Pitfalls

A faulty seal will eventually lead to electrolyte leakage and allow the cell to dry out. Insufficient pressure, and/or insufficient temperature for a too short time can prevent a proper sealing. Although the resulting imperfections may not be instantly visible, such defects are absolutely detrimental for a the long term performance of Dye Solar Cells.

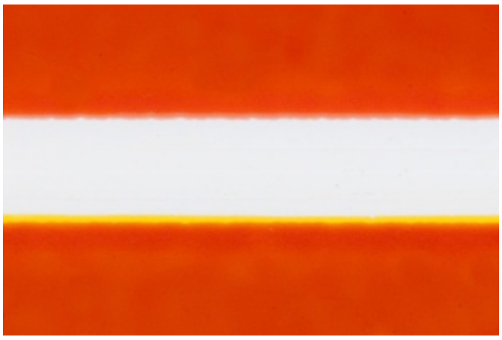
In the opposite, over pressure can spread the sealing film too thin and allow both electrodes to touch each others, causing internal short circuits. This is possibly traced by a slight conductivity between the electrodes prior to adding the electrolyte, or a very low open-circuit voltage under illumination.

Too high a temperature can also generate defects, such as forming bubbles in the sealing film, which could in turn allow the electrolyte to permeate through the gasket. Here is a series of close up views of the sealing gasket between adjacent cells in a DSC module:

The bubbles present in the sealing gasket will eventually cause leakage.



The gasket is smashed, the pockets formed in the sealing allow the electrolyte to go through.



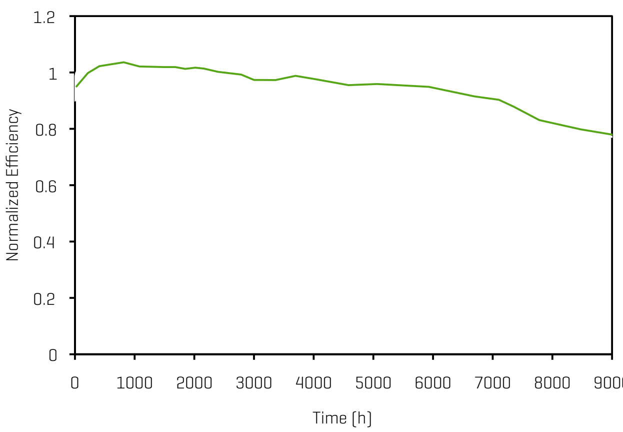
Example of a good sealing, showing the absence of noticeable defects in the gasket.

EXAMPLE

A Dye Solar Cell Sealed With Meltonix 1170-100

A 36 mm^2 titania photo-anode was prepared with 2 prints of Ti–Nanoxide T/SP and 1 print of Ti–Nanoxide R/SP on a piece of TCO22–7 glass substrate. The electrode was treated with $TiCl_4$, and stained in a solution of Ruthenizer 535–bisTBA with chenodeoxycholic acid (1:10) as a co-adsorbent. A platinum coated cathode was prepared on another TCO22-7 substrate with a layer of Platisol T. The two electrodes were laminated together using Meltonix 1170-100 and the solar cell was filled with Mosalyte TDE-250 through a hole in the cathode. The filling hole was then sealed with Meltonix 1170-100 and a thin glass circle of 6 mm diameter.

The resulting solar cell was placed under continuous 1 sun illumination using a Solaronix Solixon Class-A solar simulator. The efficiency of the solar cell was monitored yielding the following stability plot.



In this accelerated aging test, 1000 h of continuous full sun illumination corresponds approximately to the amount of light received in 1 year outdoor. The sample cell monitored here demonstrates an excellent stability after 9000 h, whereas an improperly sealed solar cell would drop within the first hundred hours.

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STORAGE AND SAFETY

Storage

Store the film in its original envelope or similar on a flat surface. Prevent from bends and wrinkles. Keep in a dry place at room temperature, away from light exposure.

The product is not known to suffer from degradation when stored properly.

Safety

Meltonix 1170-100 is for research and development use only and is intended to be manipulated by knowledgeable personnel.

For a complete description of safety measures, please refer to the Material Safety Datasheet (MSDS) of Meltonix 1170-100.

solaronix.com/msds/

RELATED PRODUCTS

Cited in This Document

- TCO22–7, FTO coated glass substrates.
- Ruthenizer 535-bisTBA, industry standard photo-sensitizer.
- Chenodeoxycholic Acid, staining additive.
- Ti–Nanoxide T/SP, screen-printable titania nanoparticle paste.
- Ti–Nanoxide R/SP, screen-printable reflective titania paste.
- Platisol T, platinum precursor paint-.
- Solixon, continuous illumination solar simulators.

Consider Also

- Meltonix 100PF, 100PF micron sealing film with protective foil.
- Meltonix 25, a 25 micron thick variant.
- Meltonix 60, a 60 micron thick variant.

REFERENCES

People Using Meltonix Products

A selection of publications using Meltonix products:

- J. Phys. Chem. C 2008, 112, 19151–19157 [doi:10.1021/jp806281r]
- Electrochimica Acta 2013, 1093, 231-236 [doi:10.1016/j.electacta.2013.04.016]
- Electrochimica Acta 2013, 99, 230-237 [doi:10.1016/j.electracta.2013.03.126]
- Journal of Power Sources 2013, 237, 141-148 [doi:10.1016/j.jpowsour.2013.02.092]
- Solar Energy Materials & Solar Cells 2013, 117, 9-14 [doi:10.1016/j.solmat.2013.05.012]
- Adv. Mater. 2013, in press [doi:10.1002/adma.201301088]
- Thin Solid Films 2013, in press [doi:10.1016/j.tsf.2013.04.096]
- Thin Solid Films 2013, in press
- [doi:10.1016/j.tsf.2013.05.153]

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