YNVISIBLE ELECTROLYTE INK - Technical Datasheet

Date: 20 .12 . 2019

CONFIDENTIAL INFORMATION

Product description

The Ynvisible Electrolyte ink is a coatable/dispensable formulation composed of high-performance organic components and lithium ions, that results in a highly ionic conductive membrane. The ink can be deposited using coating techniques and was especially designed to enhance the performance of organic electrochromic devices. The ink shows a viscoelastic behaviour and can be cured using UV irradiation. The resulting cured film is highly flexible and stretchable.

Table I - Typical Ink Physical Properties	
Viscosity*	ca. 8000 cP
Density (g/ml)	1.28 g/ml
Color	Slightly yellow (clear after curing)

* IKA ROTAVISC hi-vi I, disk spindle SP-8, 10RPM, 21°C

Mixing

The ink doesn't require mixing. Before use, verify that air bubbles are not entrapped in the ink. Let the ink settle for several hours before use to release excess of air bubbles that may have been entrapped inside during shipment or if the bottle has been shaken.

Storage and handling

Ynvisible Electrolyte ink should be stored protected from light and humidity. The ink should be stored at an even temperature in the range of 4°C to 22°C. Storage for more than 6 months is not recommended. Over time the ink may change from transparent to a slight orange color, however this doesn't affect the general properties of the ink or the resulting film.

Health and safety

Please consult the appropriate Material Safety Data Sheet available on:

https://www.ynvisible.com/ink-kit-description

Cleaning

Solution: Ethanol

YNVISIBLE ELECTROLYTE INK - UV Curing

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Description of the curing process

The Ynvisible Electrolyte ink is cured by radical polymerization using a photoinitiator (already included in the ink formulation). The conditions to cure the ink depend on several parameters, such as thickness of the electrolyte parameters, the UV lamp and the set-up. Note that excessive presence of oxygen on the surface of the film may partially inhibit the photopolymerization process. In this document, we describe known and tested curing protocols to be used as guidelines.
Individual optimization of the curing protocol may be required to adjust to the specific conditions of the user.

Photoinitiator absorbance spectrum

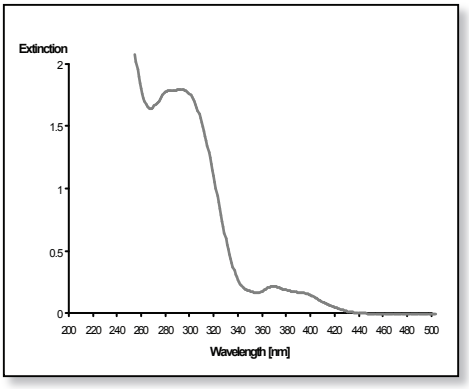

Figure 1 *- Relative absorption spectra of the photoinitiator used in the Ynvisible Electrolyte ink. To activate the photoinitiator, the ink must be irradiated with enough light at any wavelength bellow 420nm.*

UV curing protocol – Example 1: *Mercury Lamp H-type*

- 220 µm-thick film of electrolyte;
- Mercury lamp H-type (250 W, 250 mW/cm2, distance to lamp 5 cm);
- Tack-curing step: As soon as the ink is coated on the PET or PET-ITO substrate the resulting film is cured for 60s;
- Final complete curing step: After the pre-curing step the electrolyte is laminated with the top PET or top PET-ITO electrode and after the lamination the device is cured in the same conditions for another 60s.

UV curing protocol – Example 2: *Dual-UV (365nm and 405nm) LED lamp*

- 220 µm-thick film of electrolyte;
- UV-LED lamp (48 W, 70 mW/cm2, 365-405 nm, distance to lamp 7 cm);
- Tack-curing step: As soon as the ink is coated on the PET or PET-ITO substrate the resulting film is cured for 60s;
- Final complete curing step: After the pre-curing step the electrolyte is laminated with the top PET or top PET-ITO electrode and after the lamination the device is cured in the same conditions for another 60s.