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Product Information

Plexcore® PV 1000 Ink System

Catalog Number **711349**
Store at Room Temperature
Technical Bulletin AL-256

TECHNICAL BULLETIN

Product Description

Plexcore® PV 1000 is a ready-to-use ink system consisting of two inks custom-designed to work in tandem: a photoactive ink together with a proprietary hole transport layer ink. The photoactive ink is based on a high molecular weight, highly regioregular grade of P3HT [purity, 99.9975% (trace metal basis)] and a (6,6)-phenyl butyric acid methyl ester (PCBM) derivative, both of which are solution-processable. This kit provides both high purity inks required to construct a high-performance Organic Photovoltaic (OPV) device.

Performance (organic photovoltaic cell efficiency) up to 4% [NREL (National Renewable Energy Laboratory) Certified] can be achieved with this ink combination. The p/n ratio, solvent system, and hole transport layer technology for this ink system have been optimized for high performance. Other photoactive and hole transport layer materials are available commercially, and many fullerene derivatives, as well as others molecules, have been reported in the literature. For these materials, performance factors must be optimized for the device to perform efficiently.

OPV lifetime measurement is an emerging science and standardized test methods are not available. The standardization of OPV lifetime is being evaluated. Well-encapsulated devices, stored under ambient conditions, are stable for many months, with the ultimate lifetime still largely unknown.

Components

Photoactive Ink	25 ml
Hole Transport Ink	25 ml

Precautions and Disclaimer

This product is for R&D use only, not for drug, household, or other uses. Please consult the Material Safety Data Sheet for information regarding hazards and safe handling practices.

Storage/Stability

Store the product at room temperature.

In general, conjugated organic semiconductors, such as some of the components of the PV ink system, may be sensitive to higher energy wavelengths of light in the presence of oxygen. Solutions and thin films tend to show some sensitivity over time. Therefore, storage and handling in an inert atmosphere (nitrogen or argon) is recommended. A yellow filter light is a standard feature for processing these materials outside of a glove box. A combination of inert atmosphere and yellow light filter is best.

Procedure

Note: A yellow filter light is a standard feature for processing these materials outside of a glove box. Storage and handling in an inert atmosphere (nitrogen or argon) is also recommended.

OPV Architecture (see Figure 1):

- Transparent Substrate
- Transparent Anode - typically Indium/Tin Oxide (ITO)
- Hole Transport Layer (HTL) - Plexcore PV 1000 Hole Transport Ink, 40–150 nm
- Photoactive Layer - Plexcore PV 1000 Photoactive Ink, 60–250 nm
- Cathode - typically cited in literature

Preparation of the Plexcore PV 1000 Ink System

Each of the solutions is filtered prior to shipment. The Photoactive Ink may need to be heated to 50–80 °C prior to application in order to become homogenous.

Note: **DO NOT heat** the Hole Transport Ink component as degradation may occur.

The ink solutions should be free of any particles prior to coating. Both inks may be filtered upon application using a microdisc PTFE Membrane (0.45 µm).

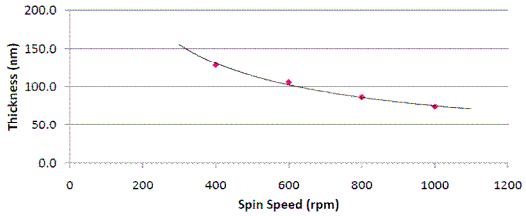
Substrate Preparation

Prior to spin coating, typical substrate preparation might include cleaning by ultrasonication in a series of solutions (water with soap, water, acetone, isopropyl alcohol) followed by UV/ozone treatment immediately before HTL ink application.

Solution Deposition via Spin Coating

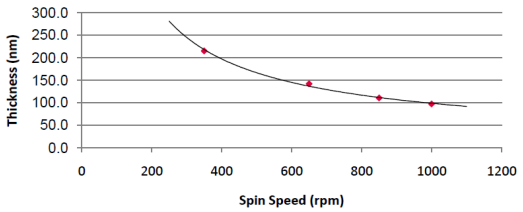
Hole Transport Layer - Spin coat the Hole Transport Ink onto an appropriate substrate. Each spin coater is different and must be calibrated by producing a spin curve (see Figure 2). This is a general guideline of film thickness versus spin rpm. The HTL ink is applied and dried prior to photoactive ink coating.

Figure 2.
Typical Spin Curve for Hole Transport Ink



Photoactive Layer – After allowing the HTL ink to dry, spin coat the Photoactive Ink onto the substrate. Each spin coater is different and must be calibrated by producing a spin curve (see Figure 3). This is a general guideline of film thickness versus spin rpm.

Figure 3.
Typical Spin Curve for Photoactive Ink.



Annealing Conditions

After forming a film with the inks, the film should be annealed at preferred temperatures of 110–175 °C on a hot plate for 15–30 minutes. This should be done in air or inert atmosphere.

Note: Temperature should not exceed 180 °C.

Plexcore is a registered trademark of Plextronics, Inc.
Product of Plextronics, Inc. U.S. Patent 6,166,172

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Figure 1.
Organic Photovoltaic (OPV) Cell Structure showing Plexcore PV Ink System