

# DuPont™ Solamet® PV416

## photovoltaic metallizations

### Technical Data Sheet

#### Product Description

DuPont™ Solamet® PV416 photovoltaic metallization paste is a silver based polymer composition. It is designed for Screen Printing for use as a front-side conductor in CIGS, a-Si and other thin film solar cell applications.

#### Product Benefits

- Low contact resistance (Rc) to ITO and AZO
- Low grid line resistance (Rgl)
- Excellent fine line capability with minimal flow-out
- Excellent adhesion to TCO

#### Processing Summary

- **Screen Printing Equipment**  
Reel-to-reel, semi-automatic, manual
- **Substrates**  
Rigid/Flexible with sputter coated TCO
- **Screen Type**  
PET or stainless steel (SD 67/25 (280 mesh))
- **Typical Drying Conditions**  
Substrate/cell dependent,  
130–180°C/5–60 min
- **Typical Circuit Line Thickness**  
18µm for 100µm track width
- **Clean-up Solvent**  
Ethylene Glycol diacetate

All values reported here are results of experiments in our laboratories intended to illustrate product performance potential with a given experimental design. They are not intended to represent the product's specifications, details of which are available upon demand.

**Table 1**  
**Typical Composition and Physical Properties**

Solids (%) at 750°C	81–84
Viscosity (Pa.s.) (Brookfield RVT, spindle #14, 10rpm)	90–130
Thinner	8260
Resistivity (mΩ/sq/25µm)	8–12
Coverage (cm <sup>2</sup> /g) (100µm track width, 18µm thickness, with SD 67/25 mesh)	~115
Abrasion Resistance (ASTM Pencil Hardness)	2H

#### Paste Preparation

The composition should be thoroughly mixed before use. This is best achieved by slow, gentle hand stirring with a clean burr-free spatula (flexible plastic) for 1–2 minutes. Jar rolling is NOT recommended, as this could change the rheology of the material. Care should be taken to avoid air entrapment.

#### Drying

Depending on the temperature tolerance of the cell and substrate, Solamet® PV416 can be dried at temperatures between 130°C and 180°C. Drying times can vary depending on the efficiency of the drier. Longer drying times and higher drying temperatures will improve the adhesion, resistivity and abrasion resistance.



*The miracles of science™*

## **Printing**

Printing should be carried out in a clean, well-ventilated area. DuPont™ Solamet® PV416 photovoltaic composition, in its container, should be at ambient temperature prior to commencement of printing.

## **Thinner**

This composition is optimized for screen printing, thinning is not normally required. Use the DuPont recommended thinner for slight adjustments to viscosity or to replace evaporation losses. The use of too much thinner or the use of a non recommended thinner may affect the rheological behavior of the material and its printing characteristics. Refer to the table.

## **Storage and Shelf Life**

Containers may be stored in a clean, stable environment at room temperature (between 5°C–30°C), with their lids tightly sealed. Storage in high temperature (>30°C) or in freezers (temperature < 0°C) is NOT recommended as this could cause irreversible changes in the material. The shelf life of compositions in factory-sealed (unopened) containers between (5°C–30°C) conditions is 6 months from date of shipment.

## **Safety and Handling**

For information on health and safety regulations please refer to the specific product MSDS.

For more information on DuPont™ Solamet® PV416 photovoltaic metallizations or other DuPont Microcircuit Materials, please contact your local representative:

### Americas

DuPont Microcircuit Materials  
14 TW Alexander Drive  
Research Triangle Park, NC 27709  
USA  
Tel +1 800 284 3382 (calls within USA)  
Tel +1 919 248 5188 (calls outside USA)

DuPont China Holding Company Ltd  
Bldg. 11, 399 Keyuan Road  
Zhangjiang Hi-Tech Park  
Pudong New District  
Shanghai 201203  
Tel +86 21 6386 6366 ext. 2202

### Europe, Middle East & Africa

Du Pont (UK) Ltd  
Coldharbour Lane  
Bristol BS16 1QD  
UK  
Tel +44 117 931 3191

DuPont Korea Inc.  
3-5th Floor, Asia tower #726  
Yeoksam-dong, Gangnam-gu  
Seoul 135-719, Korea  
Tel +82 10 6385 5399

### Asia

Du Pont Kubushiki Kaisha  
Sanno Park Tower, 11-1  
Nagata-cho, 2-chome  
Chiyoda-ku, Tokyo, 100-611  
Japan  
Tel +81 3 5521 8650

E.I. DuPont India Private Limited  
7th Floor, Tower C, DLF Cyber Greens  
Sector-25A, DLF City, Phase-III  
Gurgaon 122 002 Haryana, India  
Tel +91 124 409 1818

### DuPont Taiwan Limited

45, Hsing-pont Road  
Taoyuan, 330  
Taiwan  
Tel +886 3 377 3616

Du Pont Company (Singapore) Pte Ltd  
1 HarbourFront Place, #11-01  
HarbourFront Tower One  
Singapore 098633  
Tel +65 6586 3022

<http://mcm.dupont.com>  
<http://photovoltaics.dupont.com>

Copyright © 2012 DuPont. All rights reserved. The DuPont Oval, DuPont™, The miracles of science™, Solamet™ and all products or words denoted with ® or ™ are registered trademarks or trademarks of E. I. du Pont de Nemours and Company or its affiliates ("DuPont").

NO PART OF THIS MATERIAL MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM OR TRANSMITTED IN ANY FORM OR BY ANY MEANS ELECTRONIC, MECHANICAL, PHOTOCOPYING, RECORDING OR OTHERWISE WITHOUT THE PRIOR WRITTEN PERMISSION OF DUPONT.

Caution: Do not use in medical applications involving implantation in the human body or contact with internal body fluids or tissue unless the product is provided by DuPont under a formal written contract consistent with the DuPont Policy Regarding Medical Applications of DuPont Materials H-50103-3 ("Medical Applications Policy") and which expressly acknowledges the contemplated use. For additional information, please request a copy of DuPont Medical Caution Statement H-50102-3 and the DuPont Medical Applications Policy.

The information provided herein is offered for the product user's consideration and examination. While the information is based on data believed to be reliable, DuPont makes no warranties, expressed or implied as to the data's accuracy or reliability and assumes no liability arising out of its use. The data shown are the result of DuPont laboratory experiments and are intended to illustrate potential product performance within a given experimental design under specific, controlled laboratory conditions. While the data provided herein falls within anticipated normal range of product properties based on such experiments, it should not be used to establish specification limits or used alone as the basis of design. It is the product user's responsibility to satisfy itself that the product is suitable for the user's intended use. Because DuPont neither controls nor can anticipate the many different end-uses and end-use and processing conditions under which this information and/or the product described herein may be used, DuPont does not guarantee the usefulness of the information or the suitability of its products in any given application. Users should conduct their own tests to determine the appropriateness of the products for their particular purpose.

The product user must decide what measures are necessary to safely use the product, either alone or in combination with other products, also taking into consideration the conditions of its facilities, processes, operations, and its environmental, health and safety compliance obligations under any applicable laws.

This information may be subject to revision as new knowledge and experience become available.

This publication is not to be taken as a license to operate under, or recommendation to infringe any patent.

K25761\_Ltr 01 /2012



*The miracles of science™*