

# pvnanocell

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# First ever printed Electronics & PCB's in mass production Digital printers

# A digital revolution

Click for movie

**Click for movie** 





The game changer of electronics digital printing. Enabler for 3D, digital additive mass production of electronics.





### The PCB production process today



pvnanocell phase III



DIGITALY PRINTED 3D PCB

Print Circuit



### The Enabling Power of Sicrys<sup>™</sup> Inks













Sicrys<sup>™</sup> Inks Are Working

Supply agreements for mass production applications with big players in the industry signed.

Additional supply agreements in the pipeline.

Inks are sold through our web site to:

- Printer Producers.
- Industry development projects.
- Research institutes and universities.



### Sicrys<sup>™</sup> Inks Are Working

#### **Printed Electronics**

- Flexible and customized electronics
- Printed Circuit Boards (PCB)
  - Potential cost reductions > 30%





Coil (70 µm width, 70µm pitch)

l 70µm pitch)



PCB & One layer

70 µm width patterns

**Automobile Sensors** 

🜵 Texas Instruments

#### CleanTech

- Photovoltaic (PV) metallization
- Potential cost reductions > 10%

### IoT / IoE

Printing for mobile phones

- Antenna
  Potential cost reductions ~15%
- Touch screens
  Potential cost reductions > 50%

### **WindShield Electronics**

 In cooperation with our partner DipTech. (a Ferro Subsidiary)

### **Heating Foil**

CRESSolutions

**3D Printing** 







Sicrys<sup>™</sup> Inks Are Working





## **Competition Landscape**

### Sicrys<sup>™</sup> inks:

- Efficient cost structure.
- Robust high throughput 24/7 printing.
- Lower viscosity at high metal loading (50%+).
- Shelf life over 1 year.
- Shipping & printing at ambient environment
- Narrow pattern printing as narrow as 50 µm.
- Low resistivity: ρ < 2.5 x bulk.</li>
- Low sintering temperature (< 130 °C).</li>
- Unique Product Silver (environmental durable), Copper and solar cell metallization inks.
- SMT/soldering capable.
- 3D electronics enabler.
- Green process.
- Quick turn around.
- Variable thickness.











PVN DigiFlex Integrated Design, prototype and R&D printer.

- Unique "one shop" printers for multi layer/multi ink 3D printing.
- High accuracy.
- All in one tool to produce printed electronics.
- Competitive affordable prices, ~ \$150,000
  - Multi channel/ink platform from graphic arts.
    - Silver and copper conductive inks.
    - Dielectric inks.
  - Selective vacuum stage.
  - Substrate heating.
  - IR drying and sintering.
  - Laser sintering.
  - UV curing.
  - Inspection and measuring system.
  - High accuracy and registration.
  - Software dedicated for printed electronics.



Israel – Greece grant to develop changes (laser sintering)



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### Intellectual Property

### **Patents granted:**

USA US 9556350 Russia RU 2593311 China CN 103282969 Japan JP 6067573 & JP 6363138 Copper WO PCT/1B2015/051536 (WO2015132719) Silver WO PCT/US2011/063459 (WO2012078590)

National phase.

#### **Additional Patents:**

PVN joint patent with TAU: IP Nano wires for thin solar cells metallization: WO 2013/128458 US 9,373,515 B2 Conductive Nanowires Films.

PVN IP general (Sono chemistry – nano materials – owned by subsidiary NZE): USA 7,157,058; USA 7,504,075; IL 144638; IL 149932.





# NDA

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**OPTOMEC** 

CONFIDENT





Our engineers are involved in an array of projects around the world with leading research centers, companies, universities and more to bring the technologies for the next century:



http://www.dimap-project.eu/

**DIMAP** project focuses on the development of novel ink materials for 3D multi- material printing by PolyJet technology. We will advance the state-of-the art of AM through modifications of their fundamental material properties by mainly using nanoscale material enhanced inks.

**Partners**: Stratasys, PVN, Profactor, Phillips, Borealis, KIT, Tiger, Festo, Soreq, CIRP, Tecnan (EC Horizon 2020 finance)





https://www.hiperlam.eu/

**HIPERLAM** – A Research and Innovation Action (RIA) well-aligned to the Factories of the Future (FoF) Initiative with a strong emphasis upon demonstrating superior cost and speed performance in end-to-end processes featuring laser-based additive manufacturing in two key applications requiring high resolution printed conductive metallic lines, namely laser printed RFID antenna and laser printed Fingerprint sensors.

Partners: Orbotech, PVN, TNO, Oxford Lasers, NTUA, FlexEnable, Paragmatic, Modus (EC Horizon 2020 finance)

### LIFT Printing

Develop special pastes, for laser induced printing, for high accuracy, narrow printing capability (10µm width patterns) for PCB printing.











HELPFUL
To achieving the objectives

#### STRENGTHS

- Sicrys Single crystal conductive Metal particles.
- Special properties, IP protected.
- Unique inks for solar cells, Copper& Silver.
- Mass production capabilities.
- Experienced Customer oriented tech team.
- Beta sites & supply for mass production.
- Low cost.
- High Quality.
- Market presence.

#### **OPPORTUNITIES**

- \$100bil market & growing.
- Slim competition ink providers.
- Leader, complete printing solution.
- Innovative business model.

HARMFUL To achieving the objectives

#### WEAKNESSES

- Small team mainly focuses on technology.
- · Financial constrains.

SW

ΟΤ

- Low production capacity.
- Weak industry awareness.

#### THREATS

- Time to penetrate Market.
- Small printer installed base.
- Lack of operational presence in China.
- Improvement of Screen printing technology.

Internal Factors

# About Us

### **pvnanocell** (OTCQB: PVNNF)



#### "The team encompasses more than 200 years of relevant Business & technical experience"



#### Fernando de la Vega

**Chief Executive Officer and Chairman (Founder)** 

Holds a PhD in applied chemistry (Casali Institute, The Hebrew University). Fernando has a strong technical and management background with more than 30 years experience in the industry.



#### Eval Shpilberg **Chief Operating Officer**

Has over 30 years industrial experience, CEO of technology based companies and Corporate Vice President Consumables Division, of Creo Ltd. (Israel and Canada). Experienced marketing & BizDev executive.



#### Ram Zeevi **Chief Strategy Officer**

Over 30 years of experience as CEO of large & multinational companies, both private and public, including Zeevi Computers., one of the pioneer tech. investment companies in Israel. For the past 10 years, private investor in technology companies. Present and past board memberships include publicly traded companies, Israel the UK and privately held companies.



#### **Evyatar Cohen**

**Chief Financial Officer** 

B.A. in Business Management (2000) and was awarded his Master of Law degree from Bar-Ilan university (2003). Evyatar also worked in the PwC New York branch for five years as an audit manager.



#### Dr. Astorre Modena

Director A member of our board of directors since 2010. In 2005, he co-founded, and currently serves as General Partner of, Terra Venture Partners, an Israeli venture capital fund focused on clean technology. From 2001 to 2005, Dr. Modena was Associate and then Principal at Israel Seed Partners, a leading Israeli seed-stage venture capital firm.

#### Shai Levy Director

Currently serves as the CEO of ProSeed Venture Capital Fund and the CEO of Ratio Oil Explorations (Finance) Ltd. From 2007 to 2012, Mr. Levy served as a CFO of Elie Tahari, New York. From 2005 to 2007 he served as a Director of Financial Reporting & Compliance at Deutsch, New York.



### **Orly Solomon**

#### **External Director**

Co-founder, COO and CFO of Eye Sight Fitness Ltd. From 2014 to 2016, Ms. Solomon served as CFO of Future Values Ltd. In 2013, she served as CEO of D. Medical Industries (NASDAQ /TASE: DMED). 2010 to 2012 served as CFO and Deputy to CEO of Lito Group Ltd. (TASE: LTGR-M). From 2009 to 2010 she served as co-founder and CFO of Atid Team, Israel. From 2006 to 2010 she served as co-founder and a director of Altshuler Shacham Israel.



#### Ido Lapidot External Director

"TRIZ- Effective Innovation" consultant for various companies, inter alia, Elbit, Verint, Coca Cola, Gilat, Tuff Merom Golan, Tama and HP. 2009 to 2016, served as a Strategic Technologies Planner and TRIZ Program Leader at Intel R&D and Intel Labs. 2008 to 2014 served as an External Teacher for TRIZ and Systematic Innovation at Afeka Collage for Engineering, Israel.



# Thank you

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# Safe Harbor



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