Company Profile

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CEO

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The Problem

- Many Potential Applications for Solar Electricity Generation Need Transparency
  - Greenhouse Glass
  - Architectural Glass
- Traditional Approaches Are Not Transparent
The Technology Solution

- Brite’s patented DSSC technology will deliver 5% efficiency at 75% visible spectrum transparency.

- Brite’s technology is implemented with ink-jet printing which has profound manufacturing cost implications.

- Brite uses a solid electrolyte which has critical reliability implications versus competing DSSC technologies.
Brite Solar DSSC Technology

FTO Catalyst

Glass

Nanocrystalline TiO₂
Sensitizer Die
Quasi-solid Electrolyte

REDOX Oxidation

Brite S.A. Solar Technologies- www.britesolar.com
Technology of Dye sensitized solar cells based on nanocomposite materials mainly deposited by inkjet printing

TiO$_2$ nanocomposite film

Quasi-solid electrolyte for enhanced durability and ionic conductivity
High transparency in the visible range of light
Thermal Conductivity of the Solar Glass

Thermal conductivity $\lambda$ in steady state is given by formula:

$$\lambda = \frac{q \times d}{T_1 - T_2} \quad [W/mK]$$

where $q$ is quantity of heat passing through a unit area of the sample in unit time $[W/m^2]$
$d$ distance between two sides of the sample $[m]$
$T_1$ temperature on warmer side of the sample $[K]$
$T_2$ temperature on the colder side of the sample $[K]$

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<td>“Brite” Solar Glass</td>
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*E is the emittance of the low e coated surface.
Inkjet printing technology for transparent cells and pattern flexibility
**Color variation** changing one of the components of the panel.
Novel quasi-solid state electrolyte with enhanced durability and advantage in sealing process

Two patents protect the materials and methods
The End Product

PanePower™ Solar Windows can provide energy savings on par with triple-silver-coated solar control low-e glass but will also generate energy, helping to defray energy costs within the structure and may qualify for tradable carbon offset credits.

- Transparent multicolor Solar Windows
- Operates with diffuse radiation from any direction & either side
- Aesthetic
- Technology
- Reliability
- Cost
- Solid Electrolyte Breakthrough technology for DSSC

Brite is using InkJet Printing for deposition on Glass substrate, minimizing drastically the manufacturing cost.

Brite S.A. Solar Technologies - www.britesolar.com
Brite’s solar windows
PV module characterization

\[ G_T = 698 \text{ W/m}^2 \]
\[ \text{Area} = 864 \text{ cm}^2 \]
Brite solar glass is producing more energy per Wp installed compared to crystalline Si and thin film PV panels.
(3) UV accelerating test - 0.82 W/m² UV light soaking at 60°C (1000 hours of illumination).

Brite’s product for UV protection

UV transmittance 1.4%

Commercial product

UVA-340 Lamps vs. Sunlight

Brite S.A. Solar Technologies
Applications:

1. Greenhouses
2. BIPV
Environmental Test-Tomatoes
First Pilot Case Confirms Viability for the Plants
Competition

Leading companies with commercial ambitions and activities on glass based DSSC prototype development are:

- IMRA Aisin Seiki/Toyota (Japan)
  - Sharp Solar (Japan)
  - Sony (Japan)
  - Fujikura (Japan)
- Dongjin SemiChem (Korea)
  - 3GSolar (Israel)
  - Dysol(Australia)
Competition

- DSSC Technology has significant advantages in the general solar panel market, however durability is an issue for liquid electrolyte panels.
- Brite Solar’s Technology has Competitive Advantages
  - Solid Electrolyte
  - Ink-Jet Printing Manufacturing Process
- Brite’s is the only technology able to meet Greenhouse Requirements for a minimum of 75% glass transparency
Competitive IP Strategy

- Patent Filings
  - US-2
  - Holland -1(granted)
  - China -2

Our Intellectual Property(IP) claimed in these patents relates to the chemical composition of the materials we are using and the method of manufacturing. The method of manufacturing has significantly wide claims that gives us a considerable protection over competitors that may try to replicate the manufacturing of DSSC products on glass using ink-jet printing.
The Market

- The TAM for Greenhouse Glass is 4.5B m²/Year
  - New Glass
  - Upgrade Glass
- The Business Case for using Brite Solar technology
  - Glass Manufacturer
    - Increase in revenue/margins
  - Greenhouse Operator
    - Decrease in operating Costs
- Total TAM at 10% New Installations and 5% Upgrade
  - $15.84B /Year
Total Areas in Major Greenhouse Production Countries

North America
- United States: 8,425 ha
- Mexico: 11,759 ha
- Canada: 2,286 ha (57% Ontario)

Europe
- Spain: 52,170 ha
- Japan: 49,049 ha
- China: 2,760,000 ha
- Holland: 10,370 ha
- France: 9,620 ha
- Poland: 7,560 ha
- Italy: 26,500 ha
- Greece: 4,670 ha
- Turkey: 33,815 ha

Asia
- S. Korea: 57,444 ha

= Top 5 Countries by Area (ha)
Goto Market Strategy

- Demand is driven by Greenhouse Operators
- Demand is fulfilled by Greenhouse Manufacturers
  - Captive Glass Manufacturer or External Suppliers
- Brite Solar’s Customers are All of the Above
  - Compelling Business Models for Each

- Brite Solar’s second target market is Architectural Glass
  - Much larger market than Greenhouse Glass
Company Snapshot

- Started operations in Jan. 2010 in Greece.
- Seed funding provided by its founder (800K euros).
- Awarded an additional €1.7 mn in technology-development contracts from EU and Greek R&D initiatives.
- Team of 12 highly trained, experienced, professionals.
Brite Electrochromic

- Simple Variation in Process
  - Eliminate preparation time with inkjet printed method
  - Eliminate ink quantity ($WO_3$/ Ce-$TiO_2$) due to inkjet printer settings
  - Simple sealing method peripheral to the glass with no leaching problems due to Quasi-solid state electrolyte
  - $WO_3$ replace $TiO_2$
  - Eliminate Iodine from Electrolyte-therefore Transparent Quasi-solid state electrolyte

- Applying Electric Field Rotates Electrolyte Ions
  - Variable Attenuation
  - Latching Effect

- Similar Manufacturing Line
Brite Electrochromic Glass

Inkjet printed Nanocrystalline Ce modified TiO₂

Inkjet printed Nanocrystalline WO₃

Quasi-solid Electrolyte
Brite Electrochromic Glass
Attenuated State

Inkjet printed Nanocrystalline Ce modified TiO$_2$

Inkjet printed Nanocrystalline WO$_3$

Quasi-solid Electrolyte

Glass

FTO

FTO

-1.8 Volt

+1.8 Volt

Brite S.A. Solar Technologies - www.britesolar.com
Brite Electrochromic Glass
Transparent State

Glass

FTO

Inkjet printed Nanocrystalline WO$_3$

Inkjet printed Nanocrystalline Ce modified TiO$_2$

Quasi-solid Electrolyte

-1.8 Volt

Brite S.A. Solar Technologies- www.britesolar.com
Transmittance of Electrochromic device at UV-Vis

- Bleached
- Semi - colouring at 1.5V
- Full - colouring at 3V

Transmittance (%) vs. Wavelength (nm)
Thermal Conductivity of the Electrochromic Glass

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Brite Electrochromic Glass

Transparent

Dark
Brite Energy Efficient Glass

Energy efficient gel with low thermal conductivity between clear float glass panes

Brite S.A. Solar Technologies - www.britesolar.com
Thermal Conductivity constant ($\lambda$) = 0.17 W/mK

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