

# SID Display Week 2013 Exhibitor Forum Presentation

**Cima NanoTech**  
Advanced Materials for Electronics

**SANTE™ FS200 Touch Films**  
for faster response, lower cost,  
large format multi-touch modules

David Bordui  
Managing Director, Cima NanoTech China

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# Speaker's Bio

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**David Bordui**

**Managing Director, Cima NanoTech China**

David Bordui is a semiconductor industry professional with over 25 years of experience in electronic hardware, firmware, software design and technical team management. Bordui comes to Cima NanoTech as a 12 year veteran of Cypress Semiconductor where he held several roles including lead applications design engineer - executing Cypress' first mass production Touch Screen design wins, and numerous CapSense designs for Cypress' Tier-1 customers. Later, Mr. Bordui became the Senior Manager of Cypress' Global Touch Screen Applications teams throughout the United States, Europe and Asia. Bordui is a graduate of the University of Central Florida Electronics Engineering, and AJI Networks Business Professionals programs.

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# About Cima NanoTech

## Our Global Footprint



Korea Office & Lab  
Opening in March  
2012



SG Office & Lab Opening in May 2012

WORLD  
ECONOMIC  
FORUM

2003 Incorporated  
2008 World Economic Forum Tech  
Pioneer Award  
2010 Manufacturing Trials start  
2011 Successful Manufacturing of Gen  
1 Films  
2012 Commercialization of FS100 for  
EMI Shielding/ Transparent Heaters  
2013 50 Employees and growing



Sales



R&D



Manufacturing  
SANTE™ Dispersion



Manufacturing  
SANTE™ Coated Films



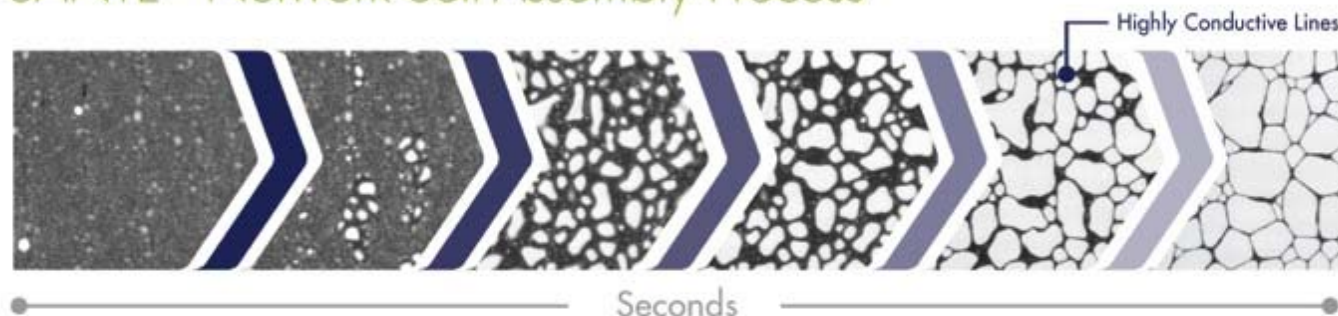
Application/Product  
Development

# What is SANTE™ Technology?

B4

- **SANTE™ Technology** is a patented nanoparticle technology that self-assembles into a metal mesh-like network pattern when coated onto substrates
- Enables transparent conductors with **outstanding electrical conductivity at High Transparency and Flexibility**
- **Diverse Novel Platform Technology** with **multiple application verticals** in various markets, including:
  - Touch
  - EMI shielding
  - Transparent heaters
  - Photovoltaic
  - OLED lighting
  - Flexible Electronics

## SANTE™ Network Self-Assembly Process



Within seconds, the SANTE™ Dispersion coated on the substrate (e.g. PET, polycarbonate, glass, etc.) self-assembles into a highly conductive transparent network.

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## Slide 4

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**DJB4**

Suggestion:

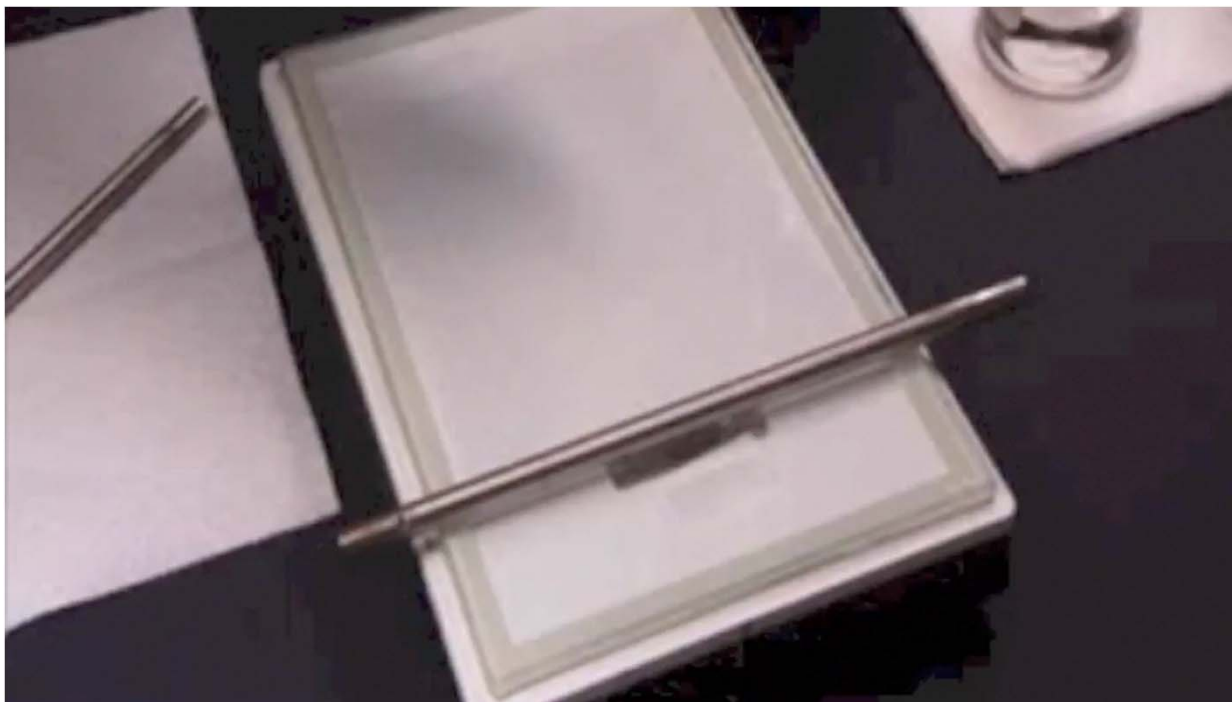
In order to distance ourselves from 'metal Mesh', I think that we should avoid having the words 'metal' and 'mesh' appear in any one sentence together.

Rephrase this to say:

...into a random, conductive silver mesh-like network...

DJB, 5/16/2013

# Low-cost, Self-Assembling Nanoparticle **SANTE™** Network



## Key Advantages of SANTE™ Technology:



More than **10X better surface resistance** than ITO



**High transparency** with high electrical conductivity



**Flexible** films that can be formed, molded, and withstand torsion and tension



**Transfer** of SANTE™ onto a wide range of substrates

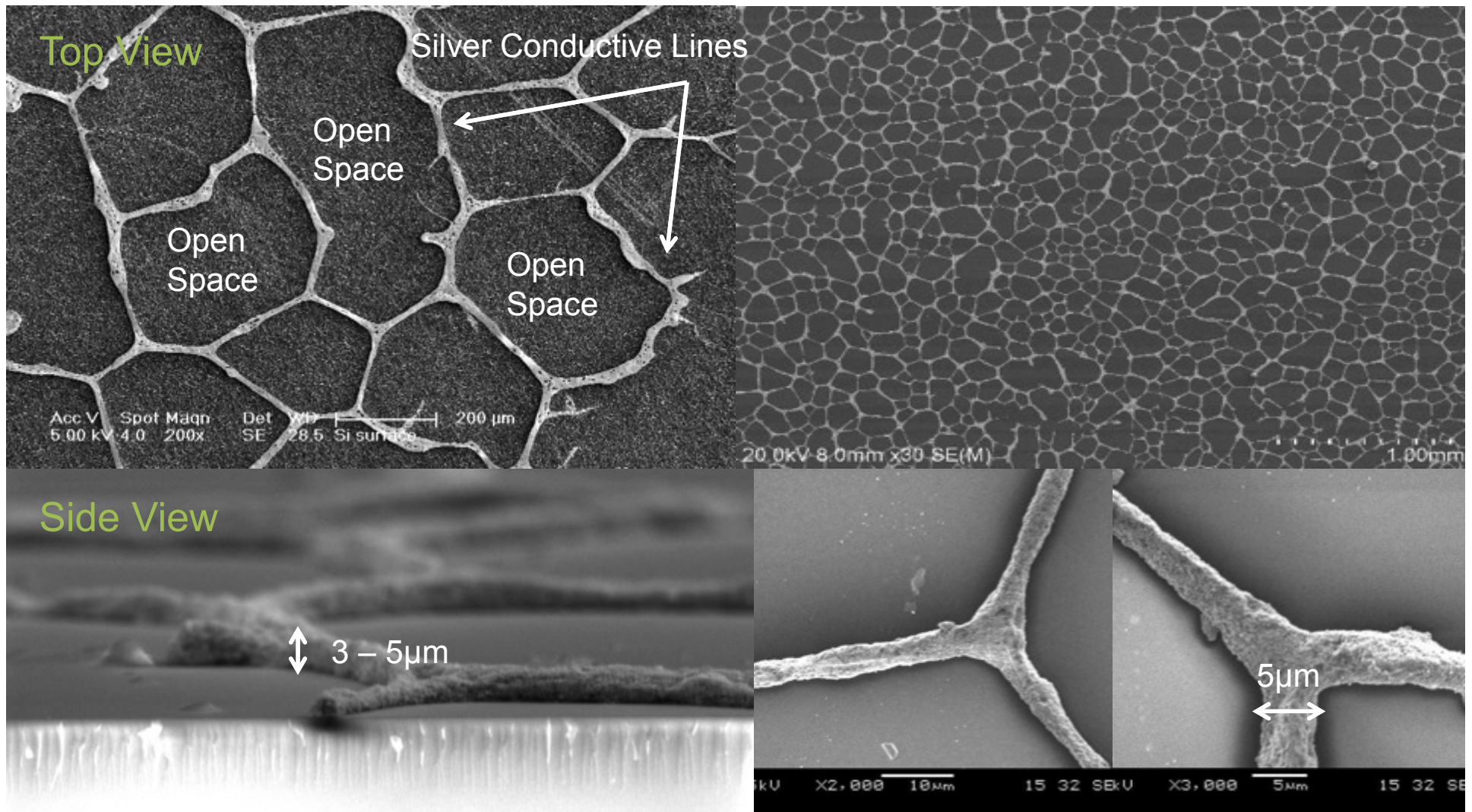


**Low-cost** wet coating roll-to-roll manufacturing process

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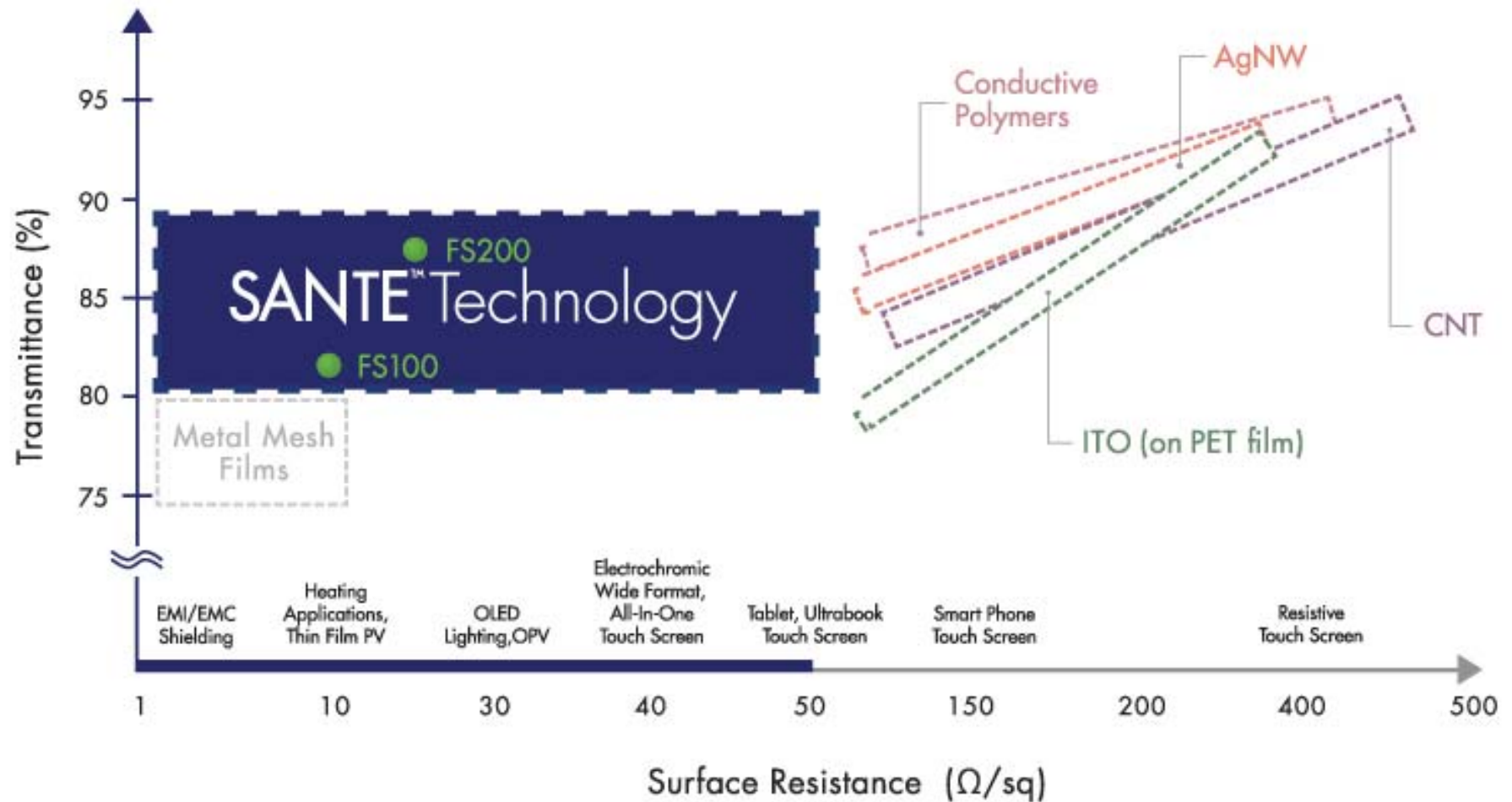


# Microscopic Images of SANTE™ Network



**SANTE™ Technology** has very thin lines (sub 5μm) and uniform pore size that is near invisible to the eye. We can meet optical grade specifications for **display** and **touch** applications.

# SANTE™ Technology - Patented Platform Technology



**SANTE™ Technology** stands **ALONE** in providing ultra low electrical resistance at high transparency as compared to other technologies and ITO (Indium Tin Oxide) films.



# \$10B Total Addressable Market Opportunity for SANTE™

SANTE™ Technology enables new products beyond ITO replacement, our focused Market Verticals include:



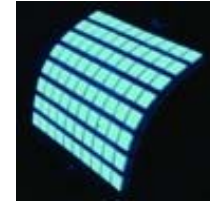
**\$3.3 B EMI Shielding**  
EMI on PET, In-Mold  
Shielding



**\$1 B Large Format Touch  
Films** Large Tablets,  
Notebooks, All in One  
Monitors, PID, Digital  
Signage, 3D Touch



**\$1.9 B Crystalline  
Silicon Electrodes**  
Backside Passivation



**\$.5 - \$1 B Substrates**  
OLED Lighting, OPV,  
Electrochromic

## Emerging Market Opportunities:



**\$.3B Automotive  
Plastic Windows**  
Heating & Anti-Fog



**\$1 B Architectural  
Window Conductors**  
Electrochromic  
Smart Windows



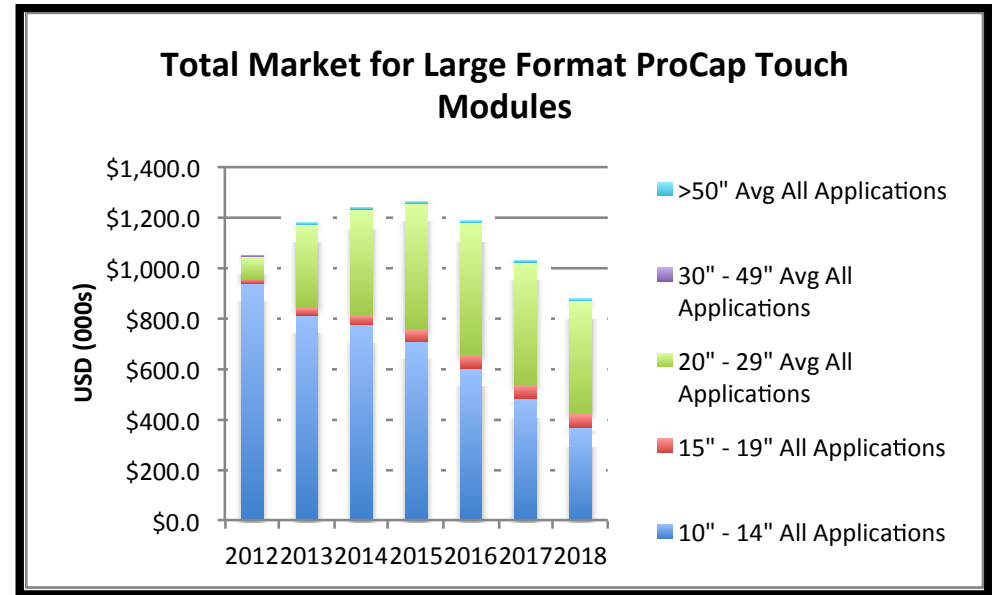
**\$.5 B EMP  
Shielding**  
Gaming



**\$.5 B - \$1B Medical**  
EMI Shielding,  
Smart Dressings,  
Flexible Electronics

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# SANTE™ Touch Films is a key enabler for Large Format Touch



Source: DisplaySearch Q1 2014 Touch Module Report

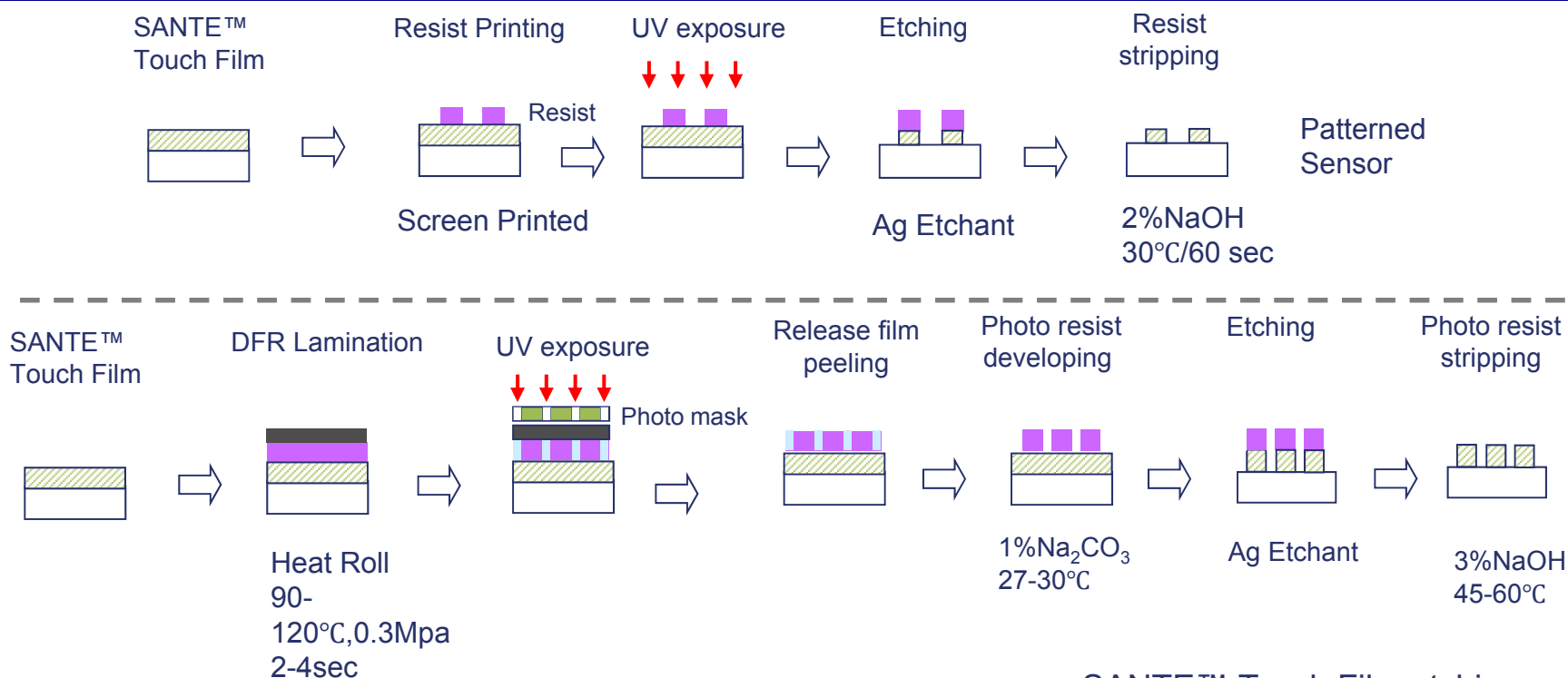
- Rapidly growing **Total Addressable Market of \$1B Market** for Large Format Touch Modules
- Driven by Windows 8 Software and Notebook replacement by IPAD and Tablets

## Our Value Proposition

- Low surface resistance (<25  $\Omega$ /sq) films – 4X better than alternatives
  - Lower resistance used for higher performance, faster multi-touch or cost savings on IC chips
- Requires excellent optics:
  - Light Transmission ~88% per sheet, <3% haze for the module

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# SANTE™ Films can be Etched using Conventional Methods: Wet Etching with printed resist/DFR



## Alkaline solution resistance

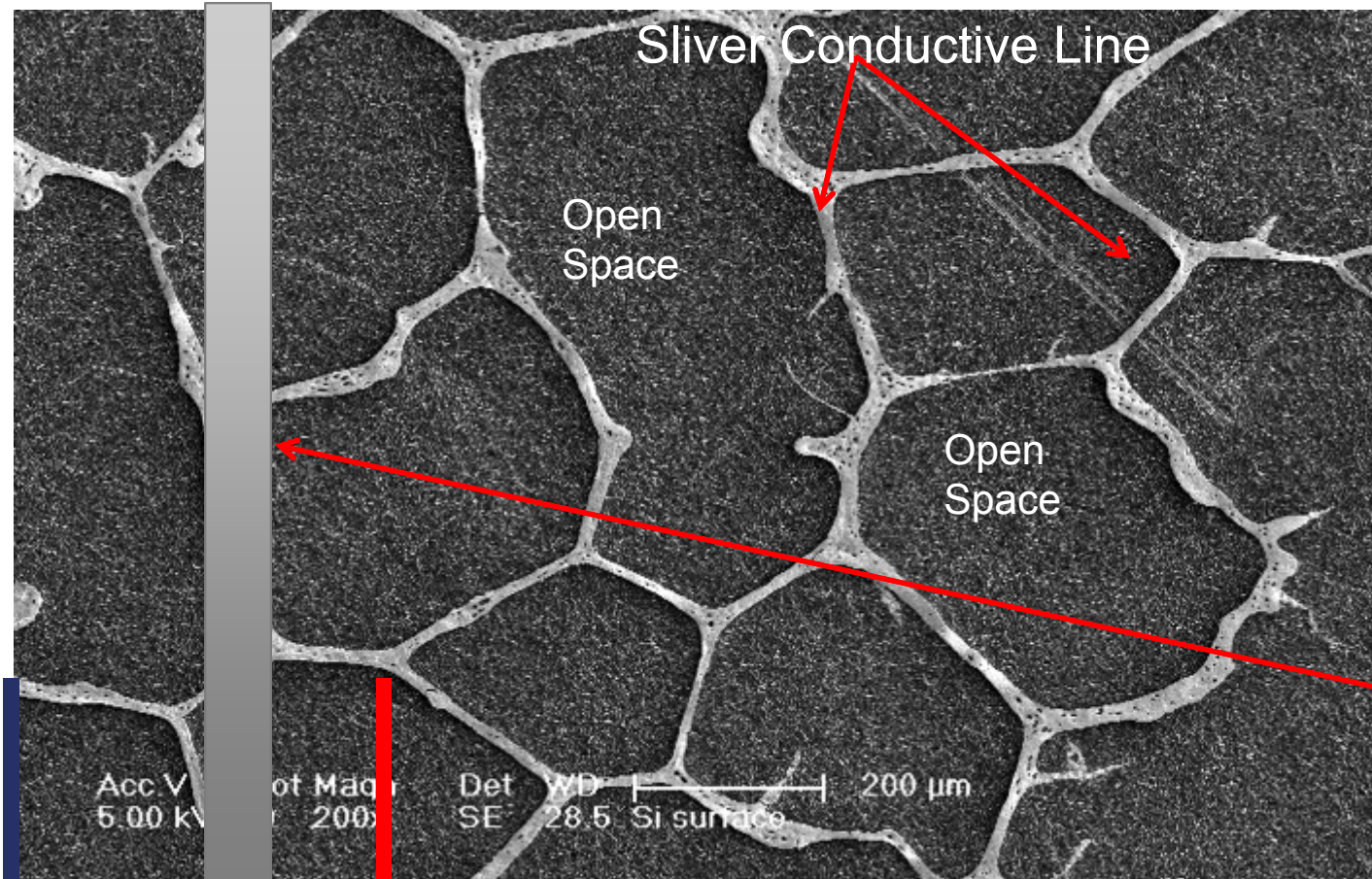
| Alkaline solution                 | Condition     | SANTE™ Stability |
|-----------------------------------|---------------|------------------|
| 1%Na <sub>2</sub> CO <sub>3</sub> | 30°C/ 10min   | Excellent        |
| 2%NaOH                            | 30°C/ 60 secs | Excellent        |

## SANTE™ Touch Film etching example

Ag Etchant  
Commercially available Aqua Regia  
38-50C, 1- 5min  
OR  
35% Nitric Acid, RT, <1min

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# SANTE™ Films can be Etched using Conventional Methods: Dry Etching: Electrical isolation of SANTE™ Film with laser



Top View

Laser Ablation for electrical isolation (10 to 50 microns)

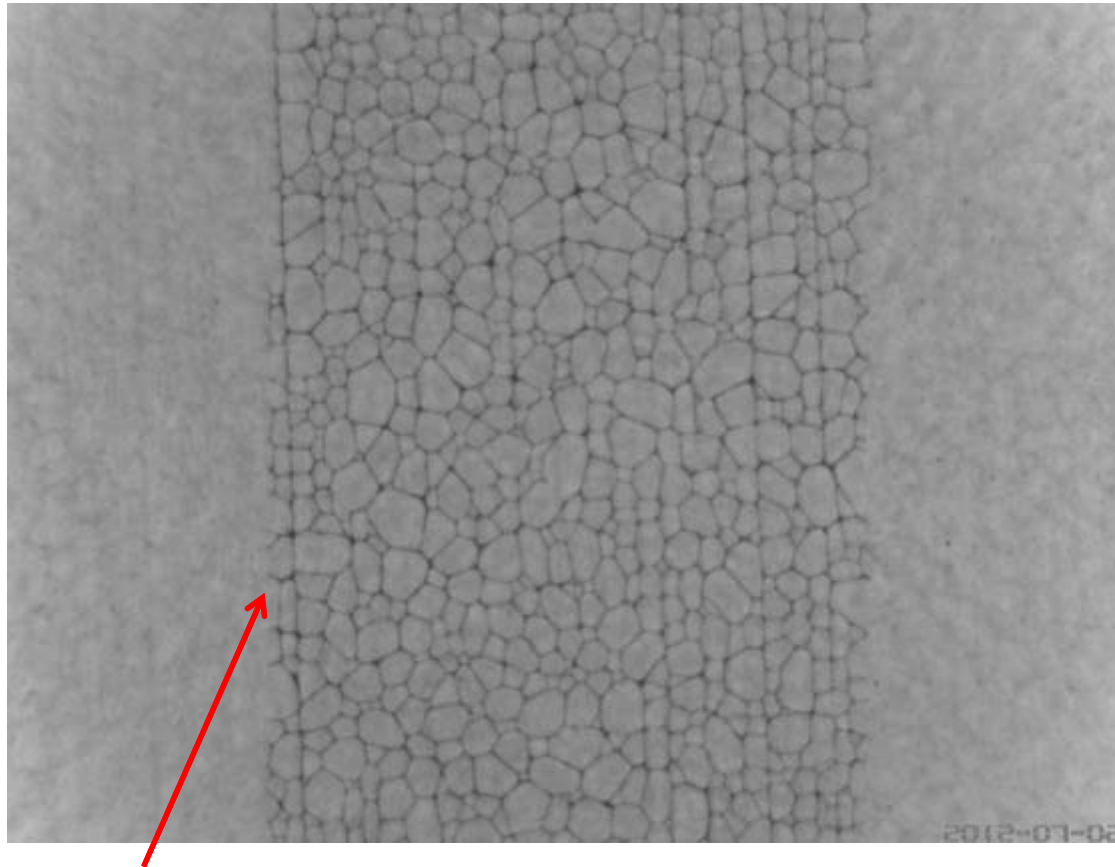
Removal of the silver traces with minimum PET damage, electrically isolated from both side of lines

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# **SANTE™ Films** can be Etched using Conventional Methods: Dry Etching: Electrical isolation of SANTE™ Film with laser

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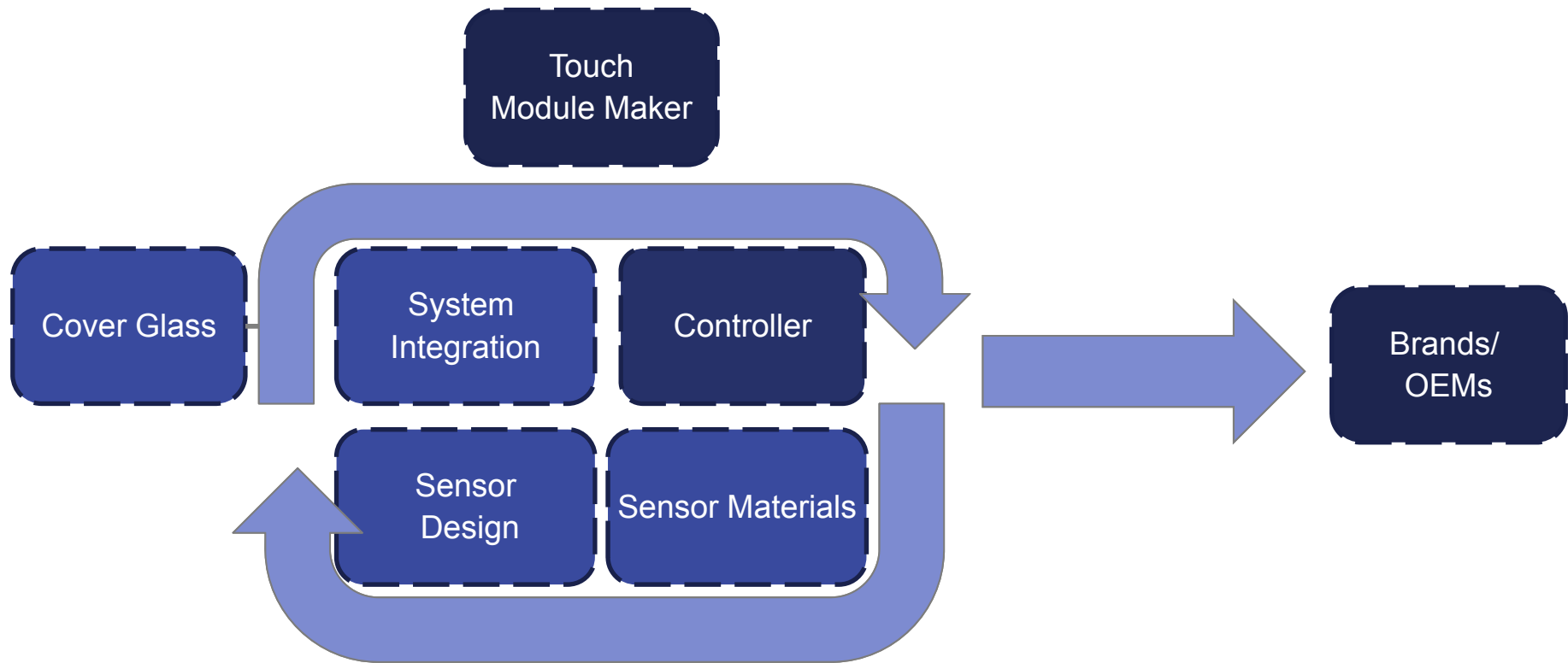


Clean laser etched border that allows good electrical isolation (Tested with 50 microns laser ablated lines, good enough for electrical isolation)

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# SANTE™ FS200 Touch Films enable Touch Module Manufacturers with Higher Conductivity Materials and Faster Design Cycles & Lower Cost

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**Faster Design Cycles and Vertical Integration** by the Touch Module Manufacturers looking for **In House Customizable Sensor Materials** and Products

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# SANTE™ FS200 Touch Films is the first product on a Roadmap of New Technologies for Large Format Touch

## Products in Development

SANTE™ FS200 Touch Films  
for  
Large Format Touch



Directed Assembly  
SANTE™ Films



In-Mold Patterned Touch  
Sensors



- **G1F:** ITO/SANTE™
- **GFF:** SANTE™/SANTE™
- **GG:** SANTE™ on Glass
- **In Cell:** SANTE™ to boost signal

We have **customers** and **partners** across the Touch Module supply chain in **Asia (Taiwan and China)** to drive spec-in.

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SANTE™

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## Summary: SANTE™ FS200 Touch Films are **Fully Customizable** Metal Mesh-Like Materials Enabling Lower Cost, Higher Performance Touch Screens

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- SANTE™ Touch Films is etch-able with methods familiar to industry.
- Superior conductivity improves refresh time, reduces power consumption and LCD interferences.
- On track on the commercialization of SANTE™ Touch Film Q3'13.
- SANTE™ has high usability –  
Thermoforming, Vacuum molding,  
Transferability, In-Mold SANTE™  
(TRUE Flexible Touch module)