

# Metallization Paste Development and Progress for TOPCon Cells

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# Gonda Profile

 **浙江光达电子科技有限公司** |  
GONDA ELECTRONIC TECHNOLOGY CO., LTD.

Established  
@ 2010

## Main Products:

- Ag metallization pastes for PERC, TOPCon, BC & HJT
- Nano and micro meter size Ag powders
- Metallization pastes for LTCC, MLCC & other passive chip components

## 01 Capital

0.26 Billion RMB

## 03 IPs

Patents: 48

## 02 Capacity

Paste: 1000 tons/year  
Ag powder: 600 tons/year

## 04 System

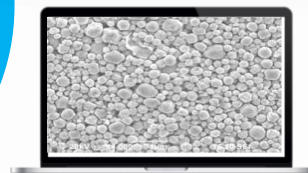
ISO9001  
ISO14001  
OHTSA18001

**GONDA**

## Manufacture Base @ WenZhou



## R&D Center @ Shanghai



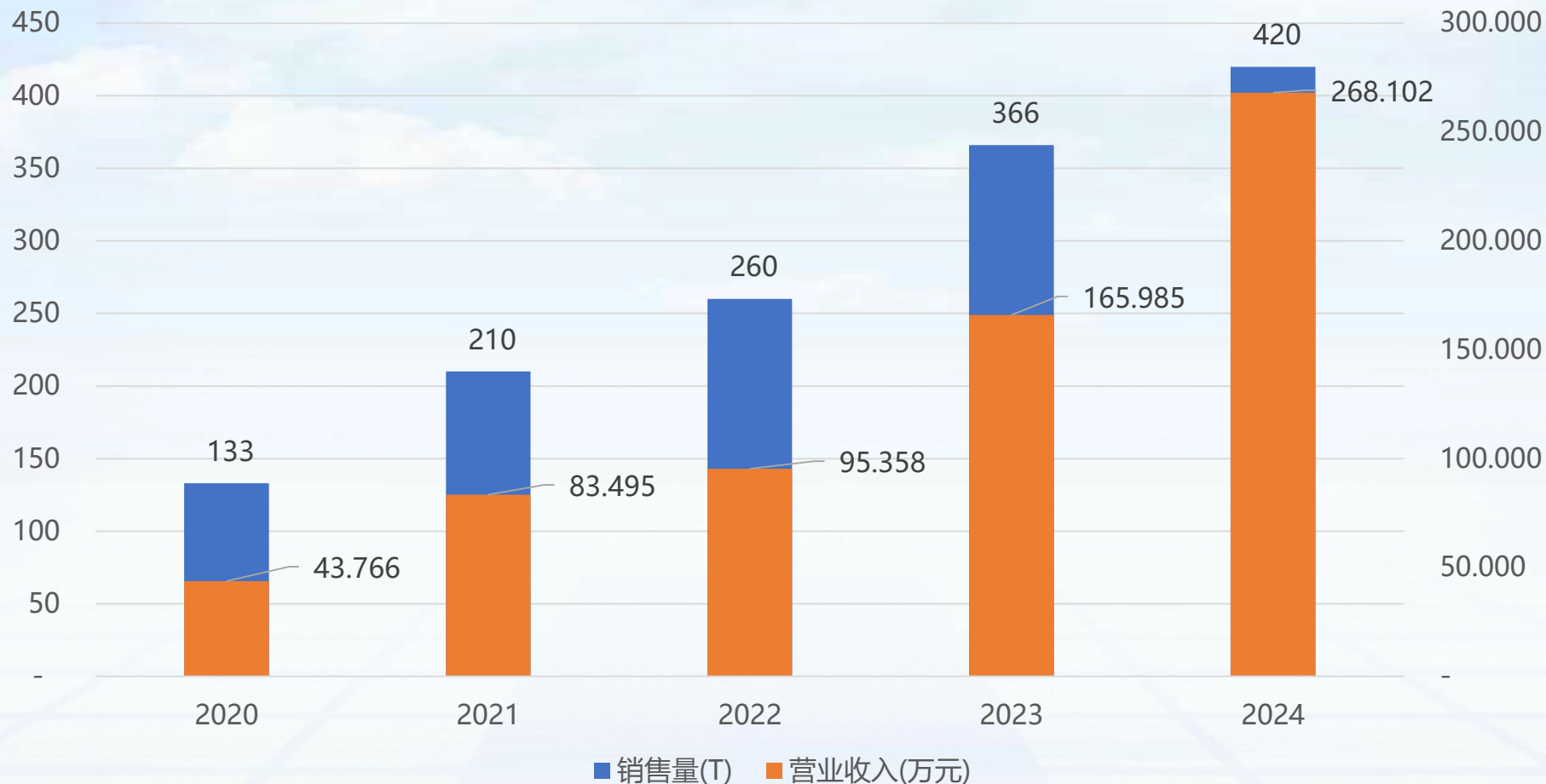
# Customers and Partners

GONDA



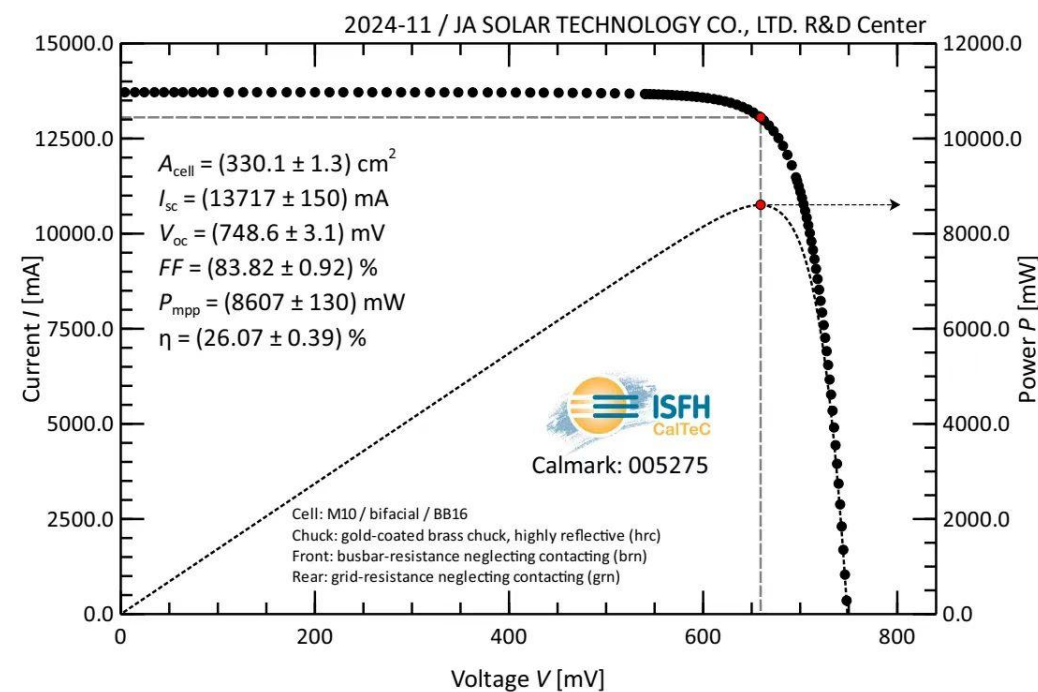


# Five Years Performance



**Sales volume CAGR ~33% Revenue CAGR ~57%**

# TOPCon cell eff. World Records



Voc: 744.6mV  
Jsc: 42.08 mA/cm2  
FF: 84.83%

Gonda Paste  
INSIDE

Voc: 748.6mV  
Jsc: 41.56 mA/cm2  
FF: 83.82%

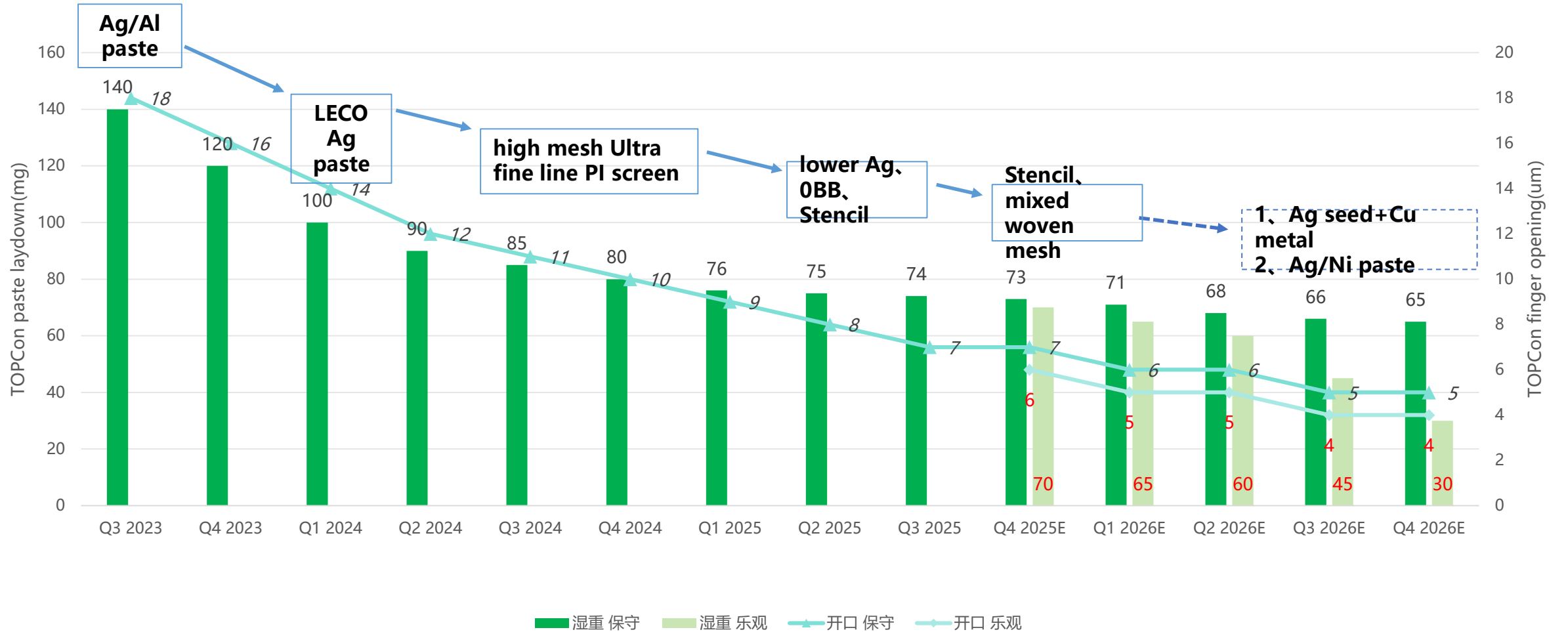
Gonda Paste  
INSIDE

# TOPCon Metallization Paste Laydown & Screen Finger Opening Trend



## TOPCon电池单片银浆耗量与网版开口趋势图

(注：以182\*183尺寸电池为统计基准)



15 mg/W

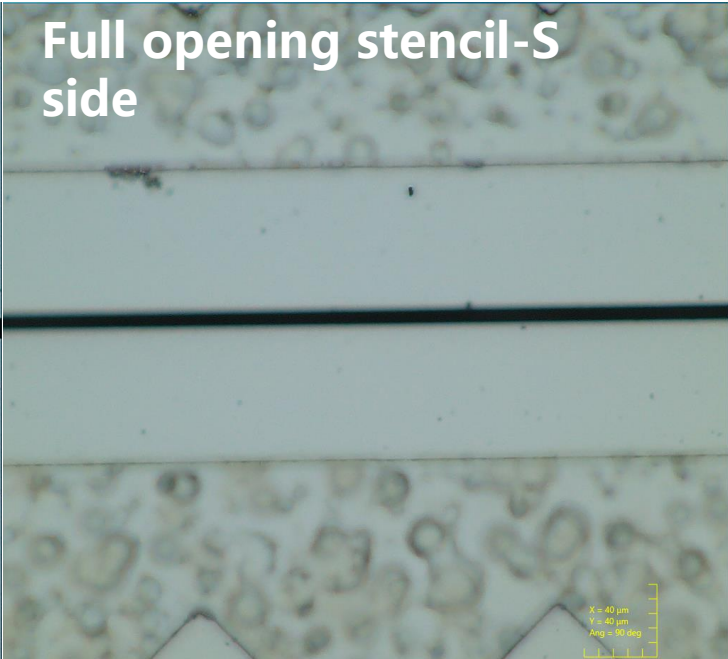
11 mg/W

9 mg/W

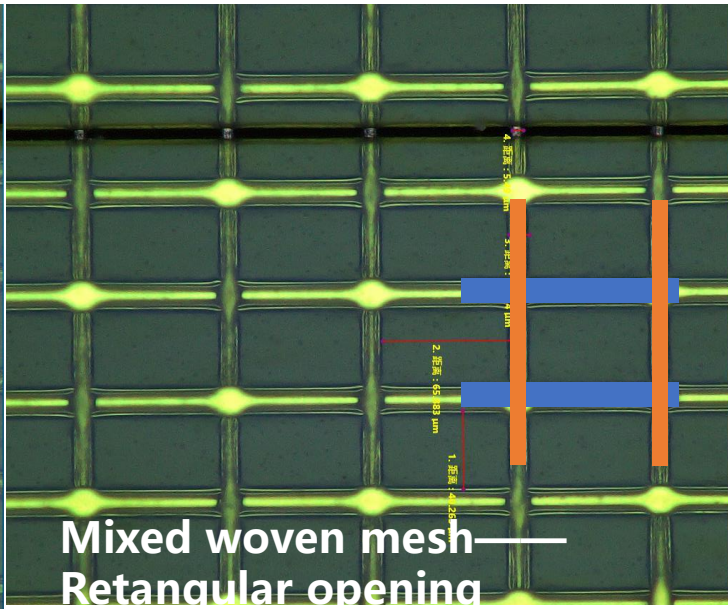
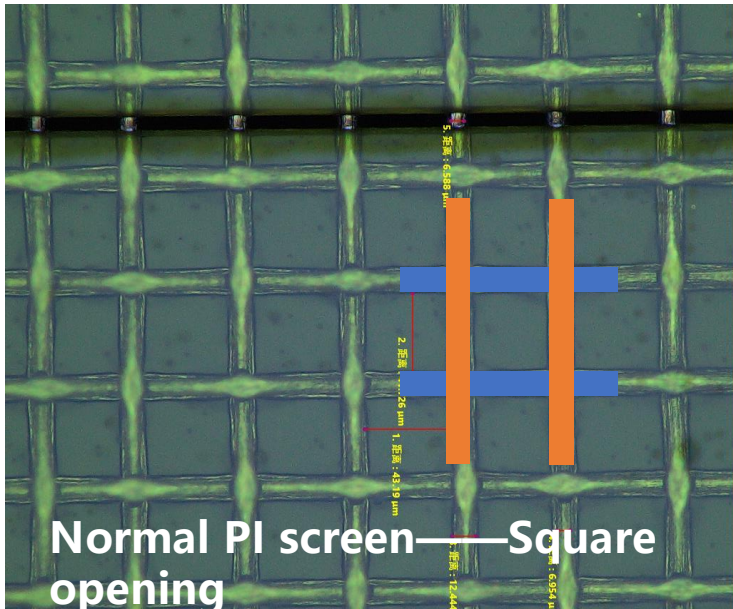
7 mg/W

2 mg/W?

# Ultrafine line - Achiving 10μm Line (after firing) @ p+ side

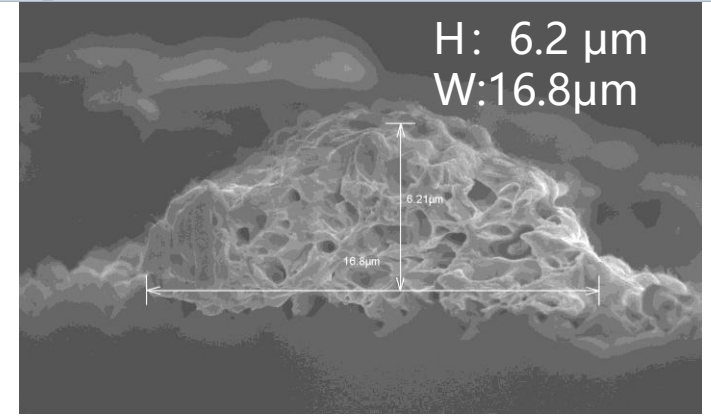
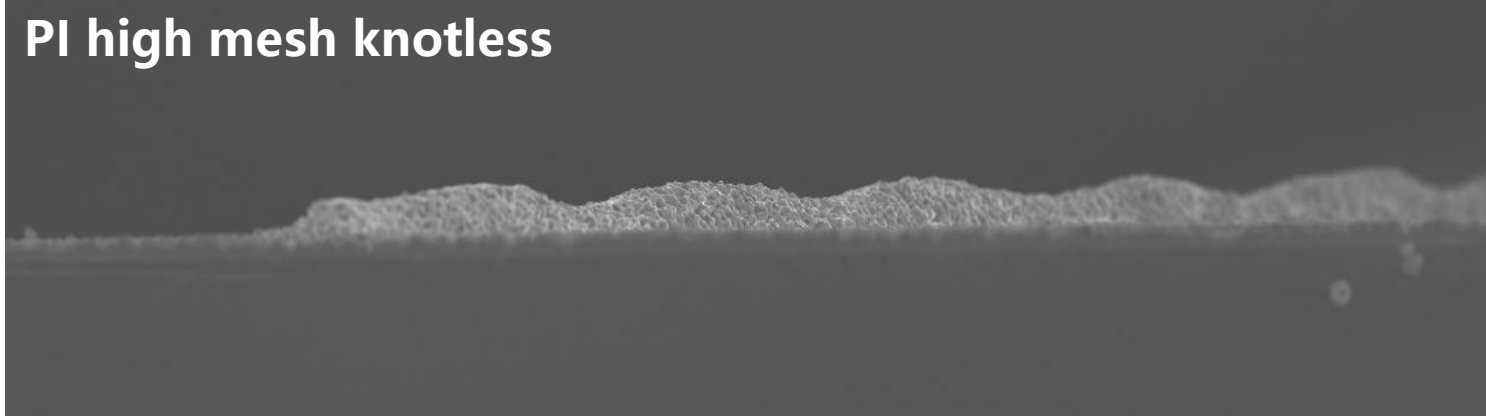


| Screen type             | Aperture opening (μm) | Open ratio ( % ) | Therotical paste transfer (μm <sup>3</sup> /Aperture) |
|-------------------------|-----------------------|------------------|-------------------------------------------------------|
| Full opening stencil    | /                     | 100%             | /                                                     |
| 600/6-13纱-4膜-9um        | 36.33                 | 85.8%            | 5297.5                                                |
| 700/5-12纱-4膜-8um        | 31.29                 | 86.2%            | 3916.3                                                |
| 700/4-9纱-4膜-7um         | 32.29                 | 89.0%            | 4170.6                                                |
| 300/8*500/11-15纱-4膜-5um | 76.67                 | 90.6%            | 23513.2                                               |

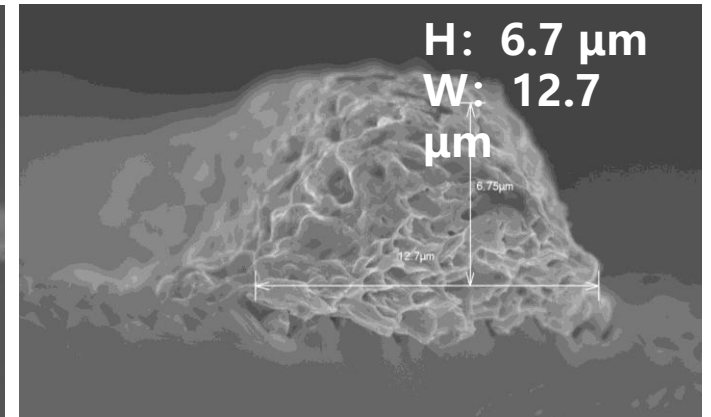
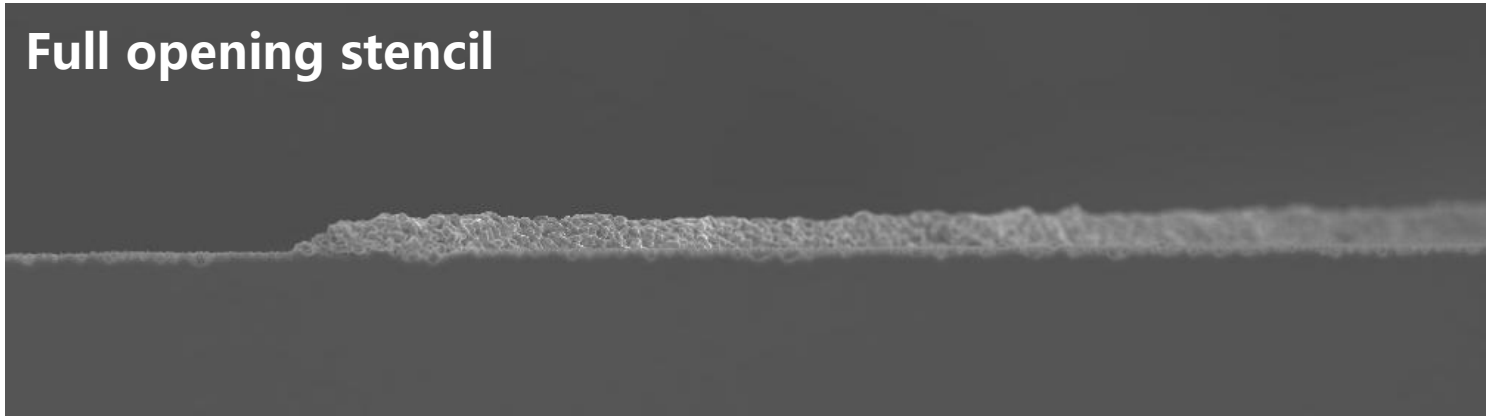


# Ultrafine line - Achieving 10 $\mu$ m line (after firing) @ p+ side

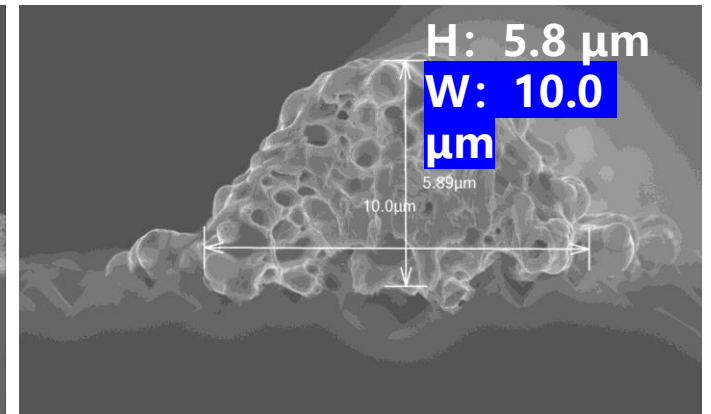
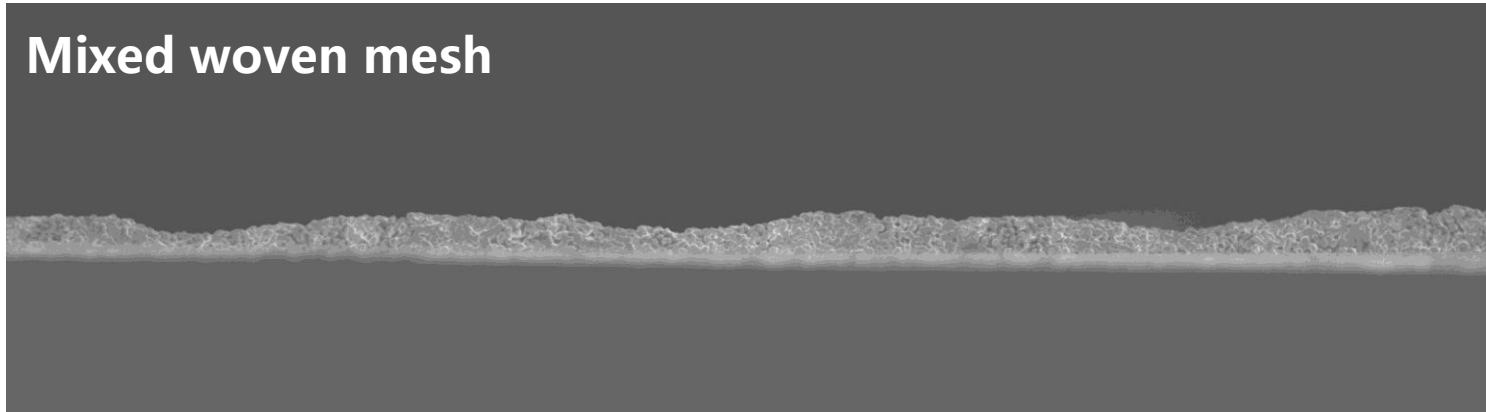
PI high mesh knotless



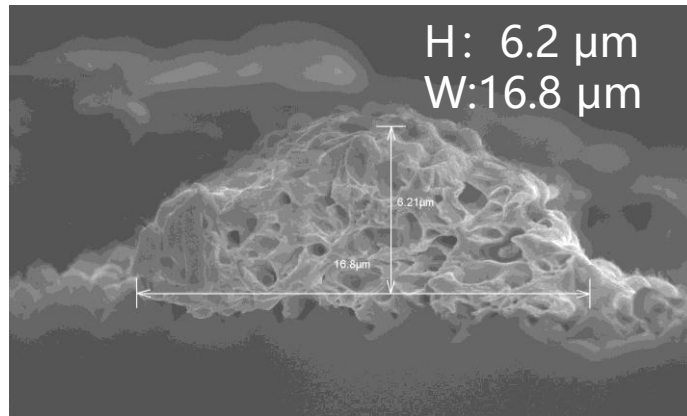
Full opening stencil



Mixed woven mesh

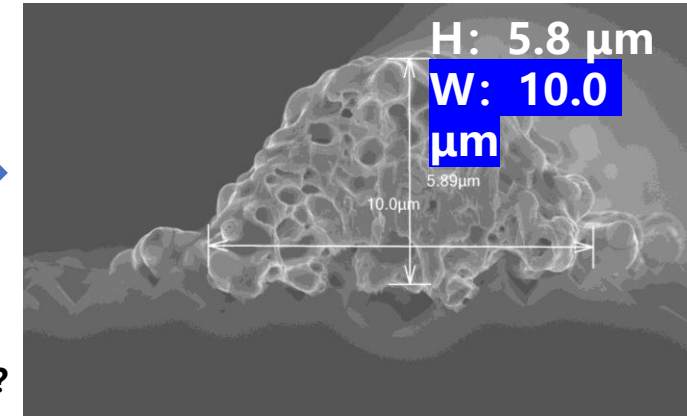


# Upgrade Untrafine Line Contactability



16→14→12→  
**Ultrafine Line**

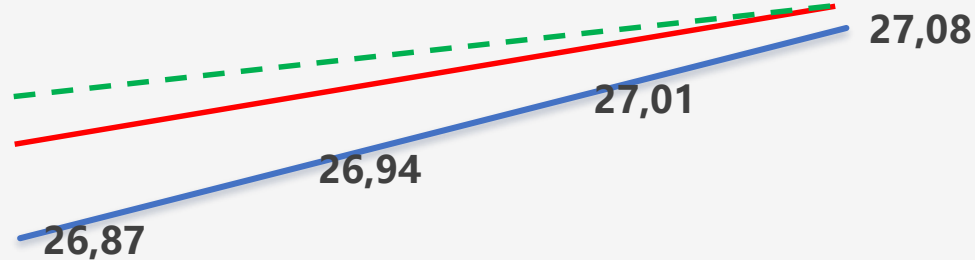
Line Resistivity?  
Contact Resistivity?



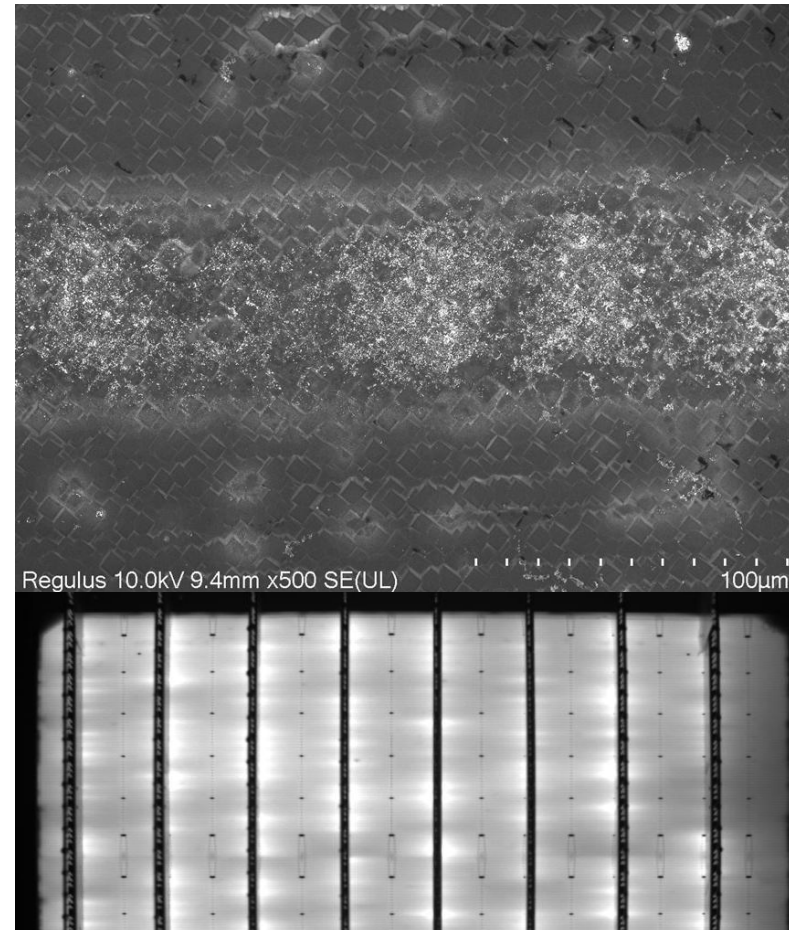
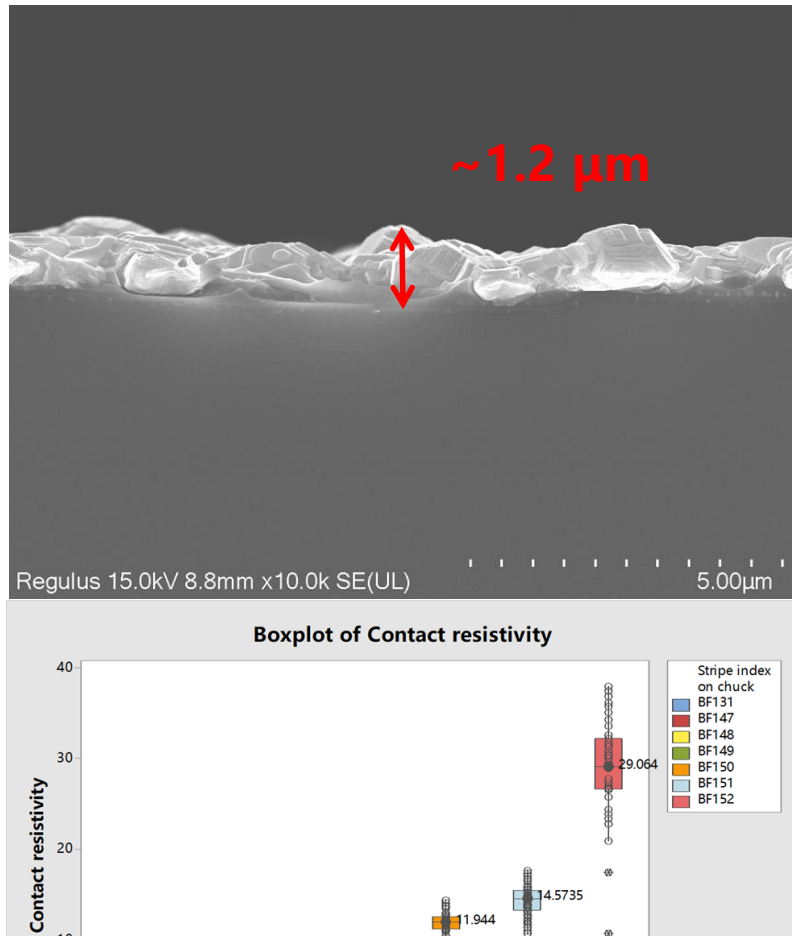
Previous Gen-Weak Contact

New Gen-Improved Contact

Eff., Laydown, Contact



# Hybrid Metallization for n+ Back Finger: Ag Seed + Ag/Cu 2nd Layer



Ag seed layer after dried

3.43µm

Dried @ ~3µm, fired @ ~1µm Ag seed could provide good n+contact!

| Seed layer | 2nd layer | Seed layer Ag (mg) | 2nd layer Ag (mg) | Total Ag (mg) | Ag reduced (%) | Eta          | Voc    | Isc    | FF    | Rs       | 备注   |
|------------|-----------|--------------------|-------------------|---------------|----------------|--------------|--------|--------|-------|----------|------|
| BSL        |           | /                  |                   | 28.51         | /              | 26.29        | 0.7388 | 15.929 | 85.37 | 0.000343 |      |
| BF256      | YL-002    | 11                 | 13.35             | 24.35         | -15%           | <b>26.56</b> | 0.7398 | 15.944 | 85.95 | 0.000126 | 常规网版 |
| BF256      | YL-002    | 2                  | 13.35             | 15.35         | -46%           | /            |        |        |       |          |      |
| BSL        |           | /                  |                   | 29.48         | /              | 26.26        | 0.7377 | 15.962 | 85.24 | 0.000383 |      |
| BF256      | YL-004    | 11                 | 8.68              | 19.68         | -33%           | 26.24        | 0.7378 | 15.984 | 85.05 | 0.000475 | 常规网版 |
| BF256      | YL-004    | 2                  | 8.68              | 10.68         | -64%           | /            |        |        |       |          |      |

# Hybrid Metallization for n+ Back Finger: Ag/Ni paste



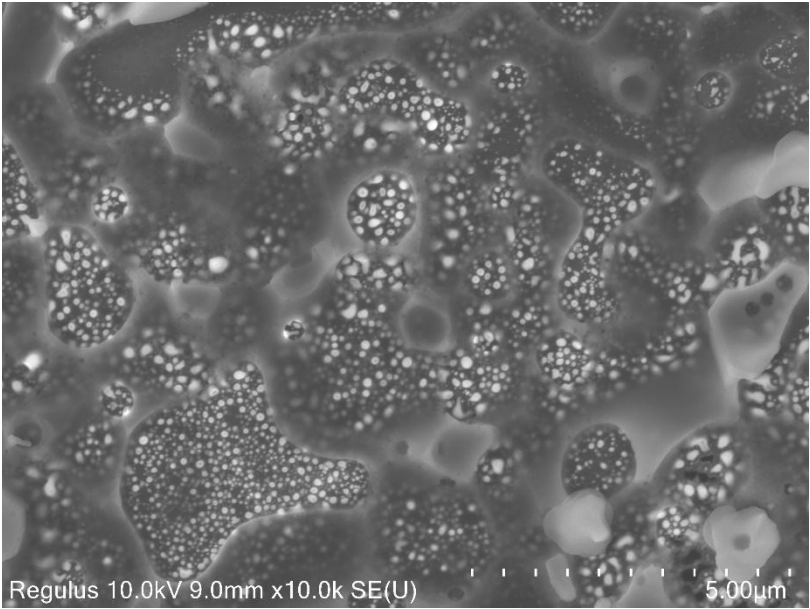
## ■ Ni @~10+wt%

客户A

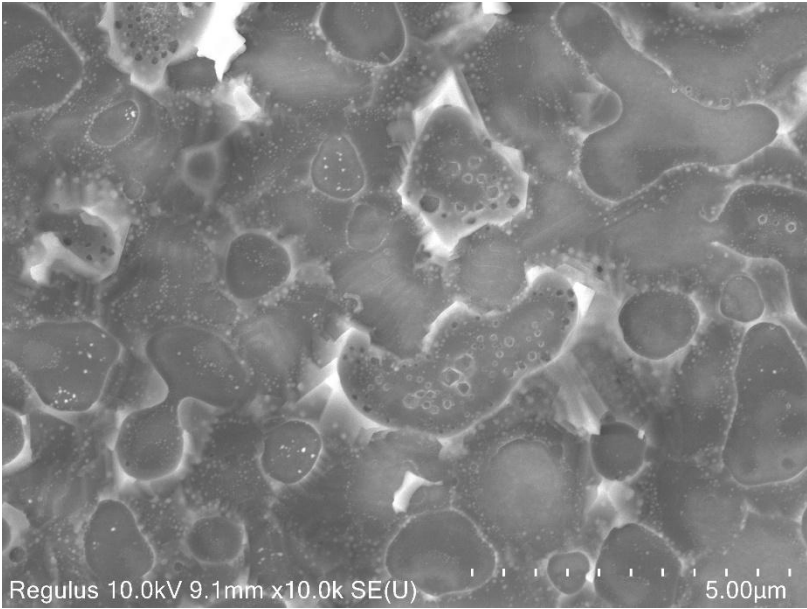
| comment | 数量   | Eta    | Voc    | Isc   | FF    | Rs     | Rsh | IRev2  | 湿重   |
|---------|------|--------|--------|-------|-------|--------|-----|--------|------|
| BSL     | 9226 | /      | /      | /     | /     | /      | /   | /      | 31.6 |
| 光达GT90  | 230  | -0.036 | 0.0001 | 0.001 | -0.14 | 0.0001 | -99 | -0.001 | 24.5 |

客户B

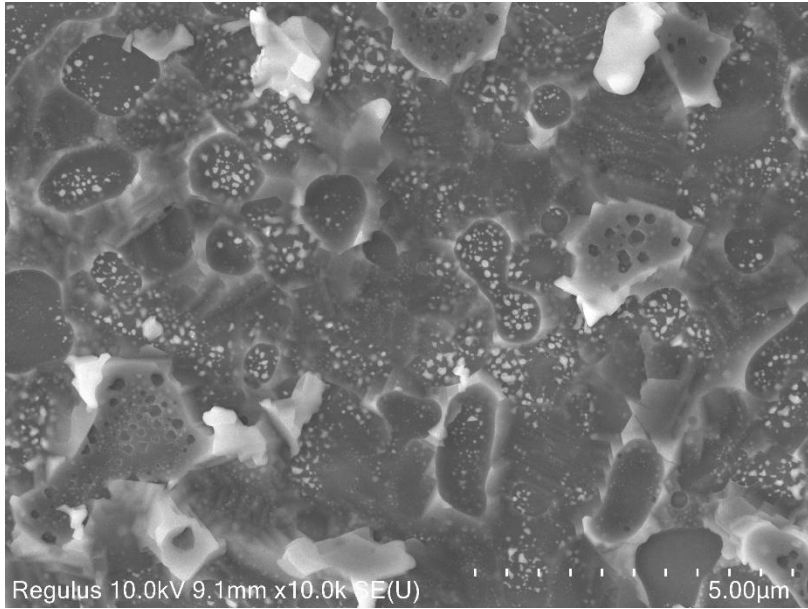
| 组别                            | 数量  | Eta   | Uoc    | Isc     | FF    | IRev2 | Rs     | Rsh  | 线高   | 线宽   | 湿重   |
|-------------------------------|-----|-------|--------|---------|-------|-------|--------|------|------|------|------|
| BL                            | 948 | 27.06 | 0.7417 | 16.1558 | 86.38 | 0.026 | 0.0009 | 2681 | 5.2  | 24.1 | 35.3 |
| SY原温                          | 288 | 26.99 | 0.7425 | 16.1403 | 86.13 | 0.025 | 0.0009 | 2776 | 5.18 | 23.1 | 34.5 |
| SY1(下温区, 6+20,7+20,8+20,9+40) | 385 | 27.02 | 0.7420 | 16.1490 | 86.27 | 0.023 | 0.0009 | 2793 |      |      |      |



Pure Ag



Ag/Ni back - last gen.



Ag/Ni - new gen.

- 1, Gonda is a vertical integrated PV metallization solution provider.
- 2, Metallization paste development (and screen tech. progress) for TOPCon has been and is still in lighting speed “卷”
- 3, Ultrafine line ( $<10\mu\text{m}$ ) and high sheet Rho ( $>600\Omega/\square$ ) for p+ side, poly finger and hybrid metalization to reduce Ag for n+ side are being pursued aggressively in mass production.

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让世界更美好

感谢观看

THANK YOU

浙江光达电子科技