As the P-type cell is getting closer to its efficiency limit, the PV industry generally turns its attention to the N-type cell with higher efficiency potential. In recent years, the N-type cell has demonstrated its advantages over the P-type cell in efficiency in many fields, especially in the N-type TOPCon (Tunnel Oxide Passivated Contact) cell.

Heraeus has supported this effort for over five years with the development and mass production of our SOL9350, SOL9360, SOL9370 and SOL9380 series pastes. Heraeus continues to innovate through investments in R&D and has developed pastes with greater performance for n-type cells.

The Heraeus SOL9390 is our newest N-type paste for p+ emitter surfaces. In conjunction with our pastes for n+ emitter surfaces, beta test customers have demonstrated higher cell efficiencies with better contact to the cell’s boron emitter.

**KEY BENEFITS**

- Better contact resistivity for high $R_{sheet}$
- Low metal induced recombination leading to higher Voc
- Improved printability / line uniformity
- Co-fireable with Heraeus n+ surface paste
- Wider firing window
- Higher green strength
- Compatible with Double and Dual printing

**SOL9390 Series**

**N-TYPE FRONT-SIDE PASTE**

**New Generation N-Type Front Side Paste**

- Better contact resistivity for high $R_{sheet}$
- Low metal induced recombination leading to higher Voc
- Improved printability / line uniformity

**eta gain**
**HIGHER CELL PERFORMANCE**

Heraeus’ SOL9390 Series is our newest front-side metallization pastes for N-type cell designs with p+ emitter surfaces. The performance of this series of pastes is an improvement over our industry leading SOL9380 Series. Test results show that SOL9390 Series has significant improvement in cell VOC while maintaining or improving FF characteristics comparing to SOL9380.

![Fig1. SOL9390A used on N-TOPCon frontside](image)

**TYPICAL PROPERTIES**

- **Wafer types:**
  - N-type PERT/ TOPCon
- **Solid content:** 91.00 ± 1 %
- **Fineness of Grind (FOG):**
  - 4th scratch: ≤ 12 μm
  - 50 %: ≤ 8 μm
- **Viscosity:**
  - CPE-51 spindle (Brookfield): 50 – 150 kcps @ 1 RPM, 25°C

**RECOMMENDED PROCESSING GUIDELINES**

**Printing:**
- Dual Print: 380/14, 430/13 ≤ 28 μm opening
- Double Print: 380/14, 430/13 ≤ 24 μm opening
- **EOM thickness:** ≤ 15 μm EOM

**Drying:** Typically dried in an IR dryer with set points of 250 – 300°C in less than 20 seconds or 150 – 200°C for 10 minutes in circulated air oven.

**Firing:** SOL9390 has a wide firing window toward lower temperature side (Red profile).

![Fig2. Test on N-TOPCon cells with Dual printing and same Busbar](image)

**IMPROVED PRINTABILITY**

Beyond the electrical performance, SOL9390 Series have improved printability and flooding characteristics over the SOL9380 Series, which enables superior line shape, uniformity and higher aspect ratio.

![Fig3. SOL9390 shows better morphology and higher AR](image)

**Storage:**
DO NOT REFRIGERATE.
Store in a dry location at 5°C – 25°C. Allow paste to come to room temperature prior to opening. Spatulate well before using.

*Contact your Application Engineering Team partner for individual advice.

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**GERMANY**
Heraeus Deutschland GmbH & Co. KG
63450 Hanau
pv.hde@heraeus.com

**CHINA (SHANGHAI)**
Heraeus Materials Technology Shanghai Ltd.
201108 Shanghai
Phone +86 21 3357 5688
pv.hmts@heraeus.com

**JAPAN**
Heraeus K. K.
112-0012 Tokyo
Phone +81 3 6902 6564
pv.hkk@heraeus.com

**SINGAPORE**
Heraeus Materials Singapore Pte. Ltd.
639335 Singapore
Phone +65 6571 7888
pv.hmss@heraeus.com

**KOREA**
Heraeus Korea Corporation
16506 Suwon-si (Gyeonggi-do)
Phone +82 31 270 9428
pv.hnk@heraeus.com

Visit us online:
www.heraeus-photovoltaics.com

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