



Product Spotlight

SOL9620 Series Patent Pending

Heraeus' Industry Leading Pastes for Standard to Ultra LDE Wafers

Heraeus has developed groundbreaking technology to improve solar cell output. Heraeus' new SOL9620 Series formulation exhibits excellent contact from standard emitter to ultra lightly doped emitter wafers, incorporating our new paste technology. Several major cell manufactures have confirmed higher cell efficiencies relative to the best front-side pastes available, with improvements ranging between 0.05% and 0.20% absolute on 90Ω/sq. wafers, with even higher gains on 110Ω/sq. wafers.

Our new paste technology used in the SOL9620 Series is derived from the integration of technologies from Heraeus and our 2013 acquisition. The new Heraeus R&D team has enhanced critical paste components that provide superior performance through formulations unlike any commercially available pastes provided by other manufacturers. Our new technology will be a platform for higher performing paste designs for a diversity of customer needs.

SOL9620 has significantly improved printability with excellent flooding and low bleeding. Post-firing, SOL9620 exhibits improved line uniformity, a higher aspect ratio, smoother line shape and a significant reduction in line width (see Figure 2). Also, the SOL9620 Series has a lower peak temperature firing requirement, ideal for PERC and n-Type cell designs.

Key Benefits

- Higher cell efficiency vs. SOL9610 Series
- Reduced contact resistance on LDE wafers
- Suitable to contact surface doping concentrations down to $1 \times 10^{20} / \text{cm}^3$
- Suitable for line openings $\geq 35 \mu\text{m}$
- Wide processing window
- Lower peak firing temperature vs. SOL9610 Series

Typical Properties

Viscosity:

HBT Cone and Plate Viscometer (Brookfield)

- 100 – 210 kcps
- CPE-51 spindle, @ 1 RPM, 25°C
Cone and Plate Viscometer (Haake)
- 13 - 21 Pas
- Plate/cone ($\varnothing = 20 \text{ mm}$, angle = 0.5°),
@ 100 s⁻¹; 25 °C

Solids: 90 ± 1.5%

Fineness of Grind (FOG):

- 4th scratch: $\leq 12 \mu\text{m}$
- 50%: $\leq 8 \mu\text{m}$

Excellent Contact on Ultra LDE

Heraeus' research and development team continues to work on improving the performance of crystalline silicon solar cells. Our SOL9620 Series is a testament to our ability to improve the output of solar cells. Customers' tests have demonstrated excellent contact performance on ultra lightly doped emitter wafers using SOL9620B. Higher cell efficiencies with increased voltage are achieved due to reductions in contact resistance on both 90Ω/sq. and 110Ω/sq. emitters (see Figure 1 for results of SOL9620B on 110Ω/sq. wafers).

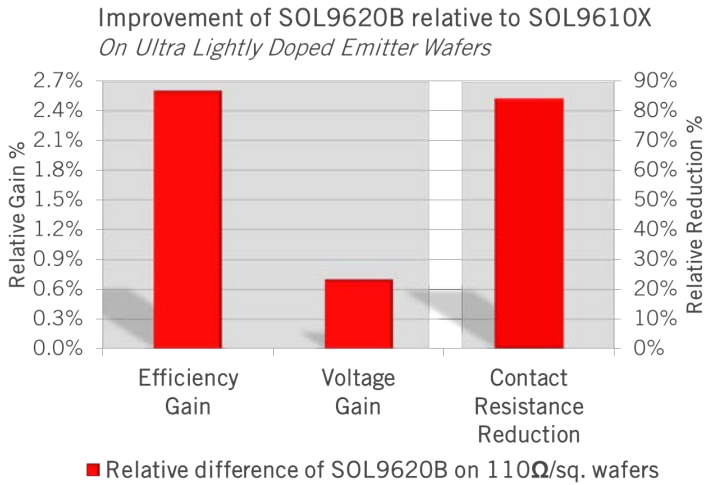


Figure 1. The SOL9620B demonstrates improved electrical performance over our SOL9610 series and other commercially available front-side pastes. Above data based on peak temperature 15K less than standard firing temperatures.

Higher Efficiency Stability

The research and development team at Heraeus is also working on the long term efficiency stability of solar cells using our metallization pastes. Preliminary accelerated aging testing by our R&D team of the SOL9620 Series demonstrated less than 0.1% degradation in cell efficiency versus 0.4 – 0.5% losses using other commercially available front-side pastes tested.

The SOL9620 Series also demonstrates stable performance at lower peak firing temperatures, maintaining high efficiency and output power. Contact your Heraeus technical service representative for more information and the specific paste for your application.

Recommended Processing Guidelines

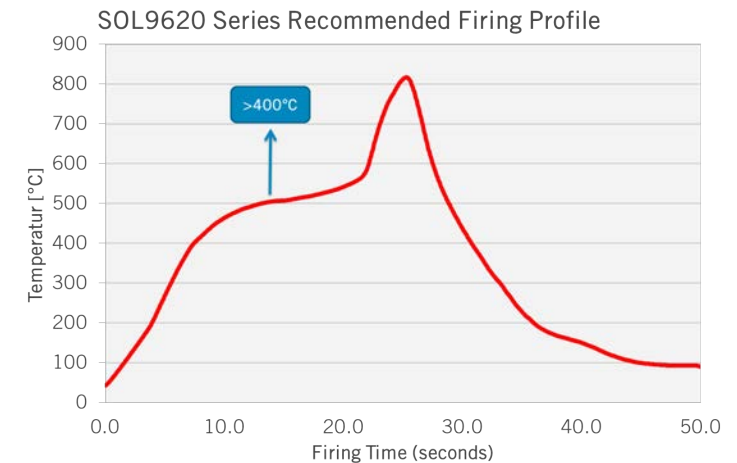
Design Finger Line Opening	Screen Parameter Recommendations
≥ 55 μm opening	290 mesh, 20 μm stainless steel wire
≥ 45 μm opening	400 mesh, 18 μm stainless steel wire
≥ 35 μm opening	360 mesh, 16 μm stainless steel wire
	Note: EOM thickness: 12-16 μm

Printing:

- ≥ 200 mm/min printing speed

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

Firing:



Note: The above firing profile is a standardized recommendation. For a profile optimized to your process, please contact your Heraeus Technical Service representative.

Storage: Store in a dry location at 5°C – 25°C.
DO NOT REFRIGERATE.

Allow paste to come to room temperature prior to opening. Mix well before using.

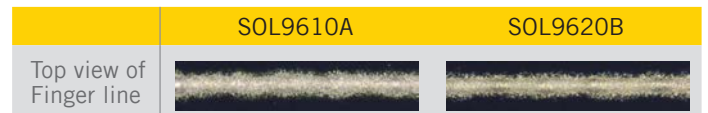


Figure 2. Improved printability and narrower line widths of SOL9620B relative to SOL9610A.

Heraeus

www.pvsilverpaste.com

Americas

Heraeus Precious Metals
North America Conshohocken LLC
Photovoltaics Business Unit
Phone: +1 (610) 825-6050
pv.techservice@heraeus.com

Europe

Heraeus Precious Metals GmbH & Co. KG
Photovoltaics Business Unit
Phone: +49 (6181) 35-3544
pv-info@heraeus.com

Asia - Singapore

Heraeus Materials Singapore Pte Ltd.
Phone: +65-6571-7888
pv.hmsl@heraeus.com

Asia - China

Heraeus Materials Technology Shanghai Ltd.
Phone: + 86 (21) 3357-5688
pv.hmts@heraeus.com

Asia - Japan

Heraeus KK
Phone: + 81-29-889-1742
info.hkk@heraeus.com

Asia - Taiwan

Heraeus Materials Technology Taiwan Ltd.
Phone: + 886-3-321-9937
pv.hmtt@heraeus.com