Enayati

Winner of 3rd Place at the Surface Technology Award "DIE OBERFLÄCHE 2026" presented by Fraunhofer IPA.

Thermally stable well beyond 210 °C

High-Temperature Silver Plating System (AgTherm®)

Nickel-silver layer systems have been established for decades wherever extremely low contact resistance is required. They represent an alternative to hard gold but reach their limits under thermal load: conventional Ni/Ag layer systems age, show adhesion failure, and are therefore unsuitable for safety-critical applications.

With the rise of e-mobility and increasing demands in power electronics, requirements for contact materials continue to grow: higher currents, elevated temperatures, and extended service life, while pressure to reduce precious metal consumption increases.

Enayati's AgTherm® coating system, based on a nickel-indium-silver layer sequence, provides a technical answer to these market requirements. A specifically developed intermetallic phase between Ni and Ag ensures long-term adhesion and thermal stability far beyond 210 °C. The coating system meets automotive requirements and can be implemented in an industrial reel-to-reel process.

AgTherm® can be integrated easily into existing products without extensive equipment modifications.

We are happy to provide technical consultation, manufacture samples for your application, and offer full support through the production approval process on our reel-to-reel plating line.

new

AgTherm® Key Benefits

- **Stable contact resistance after thermal aging**
  Resistance variation below 1 mΩ, within noise floor
- **No delamination – 100% defect-free performance**
  While comparable systems lose functionality at elevated temperatures, AgTherm® demonstrates complete resistance to thermally induced delamination
- **Visually identical to standard silver**
  The indium interlayer does not alter the surface appearance
- **Improved CO_2 footprint**
  Reduced precious metal usage significantly lowers the environmental impact

enayati.de

Contact
Tel. 07231 94950
vertrieb@enayati.de

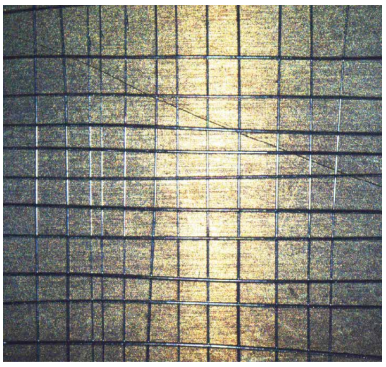
Proven High-Temperature Stability: 1,000-Hour Adhesion Test – 0% Delamination

The images document the performance of AgTherm® compared with a conventional Ni/Ag layer system after 1,000 hours of thermal exposure at 210 °C in a laboratory chamber furnace followed by adhesion testing (cross-cut and tape pull test).

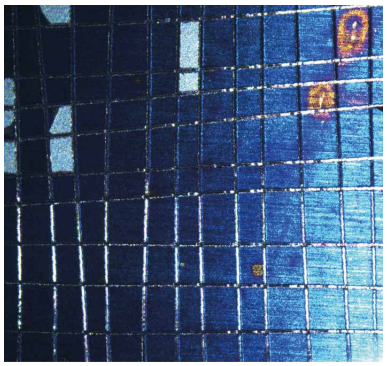
The upper image shows the innovative Nickel-Indium-Silver layer system (AgTherm®). No delamination effects are visible. Adhesion remains fully intact, providing clear evidence of the coating system's outstanding thermal stability and structural integrity.

The lower image shows a conventional Ni/Ag layer system. The silver layer has almost completely detached. The blue-colored surface indicates the exposed nickel interlayer following delamination.

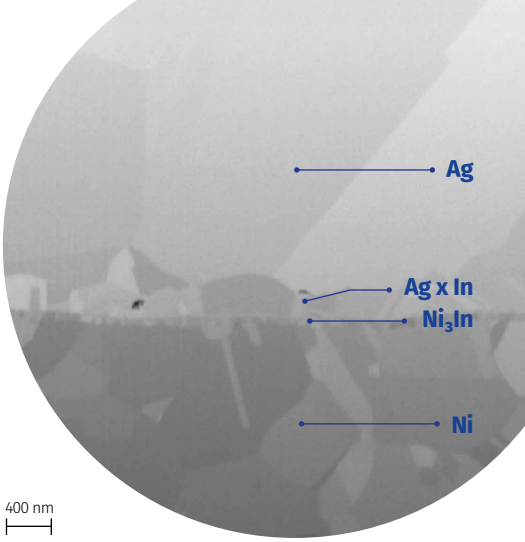
Initial adhesion failures can occur at approximately 150 °C, while continuous exposure above 170 °C leads to nearly complete delamination.



High-Temperature Silver Layer System (AgTherm®):
Complete adhesion after 1,000 h at 210 °C



Conventional Ni/Ag Layer System:
Near-complete delamination after 1,000 h at 210 °C



FIB Cross-Section Result

Looking Inside the Coating (FIB Cross-Section)

FIB cross-section analysis of the AgTherm® coating after thermal exposure at 300 °C reveals:
No pores, no defects, no impairment of the current path, stable contact resistance.

Additional AgTherm® Benefits at a Glance

No Process-related Risks, No Delamination Well Beyond 210 °C

Thermally induced adhesion failures are completely eliminated through an tailored material combination and optimized process design.

High process reliability is maintained even under continuous high-temperature operating conditions.

Reel-to-Reel Compatible, Suitable for selective plating*

AgTherm® is fully compatible with reel-to-reel processing, enabling reliable high-volume production.

Selective plating capabilities allow precise deposition of the coating only where required.

Suitable for a Wide Range of Industries*

The high-temperature-resistant contact coating, combined with significantly reduced silver thickness, provides extended service life and stable electrical performance in applications such as high-voltage connectors and relay contacts.

** Results may vary depending on the application and component geometry. We would be pleased to advise you and provide sample parts for your specific application.*