

Reproducible and scalable **Silver-Graphite (AgC)** in Reel-to-Reel Plating

Silver-Graphite (AgC) is a novel dispersion coating in which fine graphite particles are homogeneously embedded within a silver matrix. AgC combines the excellent electrical conductivity of silver with outstanding wear resistance comparable to hard gold. As a result, it offers a economically attractive alternative to hard gold for demanding contact applications while significantly reducing the associated CO₂ footprint.

AgC has already been successfully implemented on rack and barrel plating lines and is now available for the first time in an industrial reel-to-reel production process. Enayati is the first supplier to realize this innovative surface in a continuous strip plating process – process-stable, reproducible, and designed for demanding contact applications.

Application-specific adaptations are possible. 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

Key Benefits of AgC

- **Tribologically optimized:**
Coefficient of friction (CoF) $\approx$ 0.4
(approximately 50% lower than fine silver)
- **Stable electrical contact resistance:**
Comparable to silver,
independent of the number of mating cycles
- **Long service life:**
No significant degradation even after 100,000
mating cycles
- **Tarnish resistant:**
Barely visible tarnish marks without additional
passivation
- **Reel-to-reel available:**
Near-production process, selective conversion
usually possible, low implementation effort

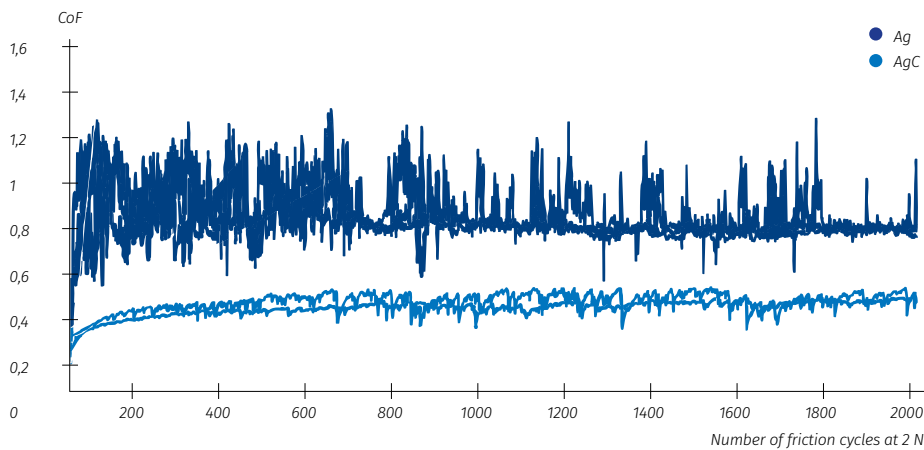


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Tribologically optimized coefficient of friction

Tribological investigations show that the coefficient of friction (CoF) of AgC is reduced by more than 50% compared to fine silver (≈ 0.4). In accelerated testing, 2,000 friction cycles at a load of 2 N were completed successfully (see graph).

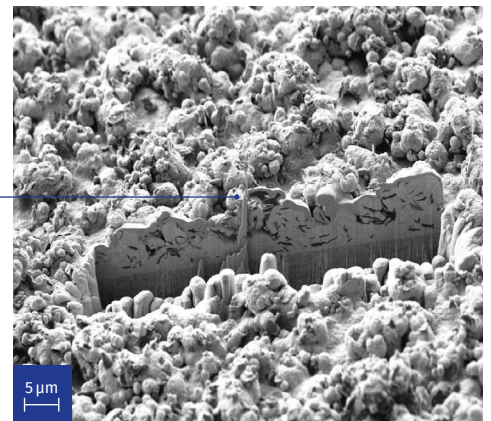
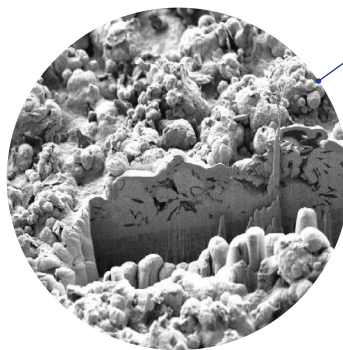
During series validation testing, AgC achieved up to 100,000 mating cycles at approximately 0.5 N contact force.

Inside the AgC Deposition Process

The FIB cross-section image shows an customer component coated with AgC and deposited on a reel-to-reel plating line.

The homogeneous incorporation of finely distributed graphite particles within the silver matrix is clearly visible. This uniform distribution is crucial for the tribological performance of the coating and forms the basis of its excellent wear resistance.

The electrolyte and process parameters have been specifically optimized to ensure reproducible particle distribution, providing the foundation for the technical performance of AgC.



© umicore Electroplating / FIB Cross-Section Result
Graphite particles are evenly distributed throughout the silver matrix.

More Key Benefits of AgC

Long-Term Perspective



The combination of optimized tribology, stable electrical contact resistance, and high thermal durability qualifies the silver-graphite coating for a wide range of applications.

For applications involving additional thermal stress, the performance range of AgC can be further expanded by combining it with AgTherm®.

Technical Reliability

The technical properties are comparable to conventional nickel-silver layer systems, but with significantly enhanced wear resistance.



Commercial Advantages

- Economically attractive alternative to hard gold
- Up to 97% CO₂ reduction compared to gold-based systems (based on an Enayati study)