CuProtect XL

Cr(III) passivation for copper foils

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Advanced corrosion protection for copper current collector foils

The ultimate Cr(VI)-free shield for copper current collector foils

CuProtect XL is a cutting-edge post-treatment technology that significantly enhances the performance and durability of copper components. By applying a nanometer-thin (1–3 nm) chromium layer from a Cr(III)-based electrolyte, the passivate ensures compliance with REACH and RoHS regulations, being completely free of Cr(VI).

The advanced CuProtect XL treatment offers superior heat resistance, preventing discoloration. Additionally, it provides high corrosion resistance, with no visible oxidation after 30 days at 60 °C and 90% relative humidity. The CuProtect XL technology maintains electrical integrity, keeping sheet resistance reliably below 30mOhm/cm²

Furthermore, its versatility makes it compatible with various production methods, including reel-to-reel operations, making it an ideal solution for modern manufacturing processes.

Features and benefits

- Fully compliant with REACH/RoHS; Cr(VI)-free
- Ultra-thin coating (1–3 nm) with low sheet resistance (<30 mOhm/cm²) and heat resistance up to 140 °C
- High humidity resistance (30 days at 60 °C/90% RH)
- Proven stability under C-rate Coulombic testing
- Production flexibility and scalability for high-speed lines
- Enhances conductivity; 50%+ improvement over untreated copper
- Compatible with reel-to-reel processes
- No impact on battery electrochemistry or performance

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The essential role of anti-tarnish solutions for copper foils

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Image 1:
Copper foil with CuProtect XL before heat treatment

Image 2:
Copper foil with CuProtect XL after heat treatment 30 min @140 °C ASD 16

Image 3:
Copper foil with CuProtect XL after heat treatment 60 min @140 °C ASD 16

The need for anti-tarnish solutions for copper foils

The need for anti-tarnish solutions in manufacturing current collectors is driven by several critical factors. Firstly, oxidation significantly impacts the performance of copper components by increasing contact resistance, which can compromise the integrity of electric connections. Additionally, untreated copper is highly sensitive to heat, leading to both visual and electrical degradation when exposed to elevated temperatures. This degradation can affect the reliability and longevity of the battery's current collector. Furthermore, modern manufacturing requirements necessitate high-speed processing and adherence to RoHS (Restriction of Hazardous Substances) compliance, which limits the use of traditional Cr(VI)-based passivation methods due to their environmental and health hazards.

Outstanding versatility for modern manufacturing processes

The CuProtect XL anti-tarnish solution demonstrates remarkable versatility by operating effectively at various current densities, making it adaptable to different manufacturing requirements. The thickness of the applied coating is directly influenced by both the duration of the treatment and the current density used during the process. This flexibility allows for precise control over the coating thickness, ensuring optimal performance and protection tailored to specific application needs. By adjusting these parameters, manufacturers can achieve the desired balance between durability and electrical conductivity, enhancing the overall reliability and efficiency of copper components treated with the CuProtect XL technology.

Coating thickness variation at different current densities

Current density (ASD)	Time (sec)	Thickness (nm)	Standard deviation (nm)
50	5	2.697	0.882
50	10	3.145	0.553
50	30	3.540	0.379
100	3	1.572	0.221
100	5	1.951	0.5