

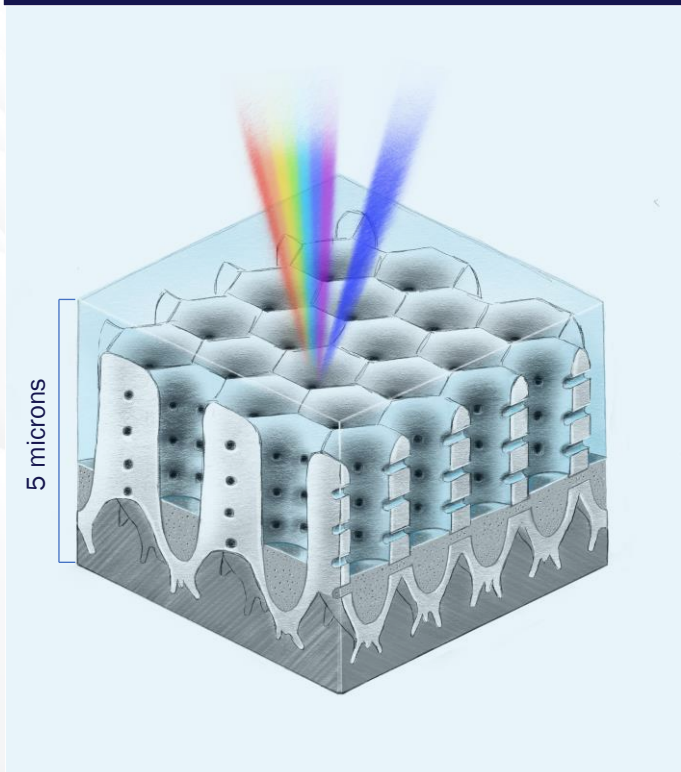
# Paint-free coating for Aluminum

CIRRUS HYBRID™ COLOR PRODUCT INFORMATION

**Cirrus Hybrid™ Color** is a patented novel coating technology that delivers greater energy efficiency, environmental friendliness, and protection while being lighter-weight than organic or paint coatings

**Aluminum** is the first choice of material for applications in **architecture, automotive and aerospace**, due to a high **strength-to-weight ratio** and **corrosion resistant oxides layers**. Typically these industries use paint or organic coatings which are not only highly energy intensive, but also use toxic chemicals that are increasingly running foul of environmental regulations. **Cirrus Hybrid™ Color** leverages a combination of **anodization and electro-deposition** to create a **nano-pore structure** that interferes with the wavelengths of light. The result is a uniform colored surfaced that is **exceptionally scratch and corrosion resistant** – providing a **paint-free solution to manufacturing**.

## CIRRUS HYBRID™ COLOR ILLUSTRATION



## BUSINESS BENEFITS



### Cost savings:

Reduced application time, reduced energy use to apply and lower material input costs



### Marketability:

Exceptionally durable finish, maximally light-weight, environmentally friendly alternative to paint & other organic coatings



### Competitive advantage:

Exclusive license enables release of the technology ahead of competitors

DEPLOYING PATENTED TECHNOLOGIES TO DELIVER CUSTOMER  
OUTCOMES THROUGH SUSTAINABLE COATINGS AND NANO-COMPOSITE MATERIALS

# Paint-free coating for Aluminum

## CIRRUS HYBRID™ COLOR PRODUCT INFORMATION

### FEATURES

- ▶ **Tough**  
Embedded, hard-wearing, thin-film composite coating that both etches into the alloy and develops a final protective seal.
- ▶ **Light-weight**  
Unlike existing light metal paints or other coatings, the process is subtractive and is suitable for light-weighting of components; components typically weigh the same or slightly less post finishing.
- ▶ **Simple**  
Cirrus Hybrid™ Color provides the user with a more energy efficient process to color coat Aluminum

### SUSTAINABILITY DRIVERS

- ▶ Light-weight coating solution, suitable alternative to paint applications
- ▶ Paint-free: applied with no VOC/ particulate emissions or toxic chemistry
- ▶ No high temperature post-treatment or baking, reducing CO2 emissions
- ▶ Range of colors using the same process

### PROCESS COMPARISON

	STANDARD E-COAT	CIRRUS HYBRID™ color	DIFFERENCES
PROCESS	Pre-treatment -> E-Coat -> Post Rinse -> Bake	Coat->Seal	Reduced steps, reduced rinse requirements
TIME TO COAT	6hrs	1.5hrs	Faster
STEPS	4	2	Fewer process steps.
ENERGY & MATERIAL USAGE	Very High	Low	Much lower energy use, with associated GHG reduction
VOLATILE ORGANIC COMPOUND	High	Nil	VOC emissions are largely eliminated
OTHER EMISSIONS	Particulate, washdown, plus GHG in drying & NG thermal oxidation.	Limited, closed-loop system.	



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### A WIDE RANGE OF COLORS ARE POSSIBLE

Cirrus Hybrid™ Color Technology is an ambient temperature plated color solution, applied in an automated closed-loop plating system that removes air-borne emissions. The nano-structure created by Cirrus Hybrid™ technology is closely tuned to the wavelength of light, generating an accurate and consistent color match. Through use of Bruggeman Mixed Media approximation and the Fresnel Equations, the reflection spectra of simplified coatings were simulated below.



DEPLOYING PATENTED TECHNOLOGIES TO DELIVER CUSTOMER OUTCOMES THROUGH SUSTAINABLE COATINGS AND NANO-COMPOSITE MATERIALS