ProFlux Nanowire® Technology

Hydrophobic Coating for Wire-Grid Polarizers

HTS Coating Technical Note

MOXTEK Polarizer and PBS Plates

Introduction

MOXTEK's broadband wire-grid polarizers provide excellent polarization contrast and transmission at wide cone angles. These inorganic polarizers are extremely small and are designed to tolerate high temperatures.

Moxtek wire-grids are made of high purity materials which provide great optical properties but are susceptible to damage from water and oils droplets. Moxtek has developed the HTS protective coating for applications that expose the polarizer to water or oil droplets. This hydrophobic coating protects the wire-grids from damage caused by extreme environmental conditions where moisture, oily contaminants, and heat exposure are expected.

Features (HTS Coat)	Benefits (HTS Coat)
Water Contact Angle (WCA) > 120°	Self-cleaning surface
	Low roll-off angle
	Prevent water and oil wicking
Thin HTS coating layers	Minimal optical performance impact
Hydrophobic	Prevents water corrosion/damage
Oleophobic	Prevents oil/organic pollutant damage
Heat tolerant materials	High temperature durability

Benefits of HTS Protective Coating

Hydrophobic (Water Repelling)

The HTS protective coating is hydrophobic which repels water and keeps it from contacting the wire-grid surface. Water can cause severe damage to the aluminum wire-grid if not treated. The water contact angle after HTS treatment is greater than 130°, exhibiting high hydrophobicity.

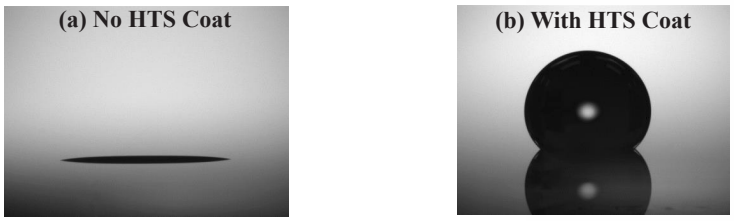

Figure 1. Demonstrates the impact of the HTS protective coating on a wire-grid polarizer. (a) is not treated, showing a flat drop of water. (b) Is treated with hydrophobic HTS coat, showing a droplet of water with high contact angle.

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Oleophobic (Oil Repelling)

Sometimes oil based pollutants are exposed onto the wire-grid surface of the polarizer. In this case, the HTS coat will provide durability protection. Oleic acid was used to demonstrate the oleophobicity of the HTS coating. HTS is shown to repel the oil droplet as demonstrated in Figure 2.

Heat Tolerance

The HTS protective coating maintains hydrophobic and oleophobic properties when exposed to high temperatures. Polarizers were heated in an oven at 300°C, in air, for over 3,500 hours with very little impact to the Water Contact Angle (WCA). See figure 2.

Figure 2. Images above show water droplet on wire-grid polarizer. Water contact angle was measured before and after 300°C exposure for over 3,500 hours.

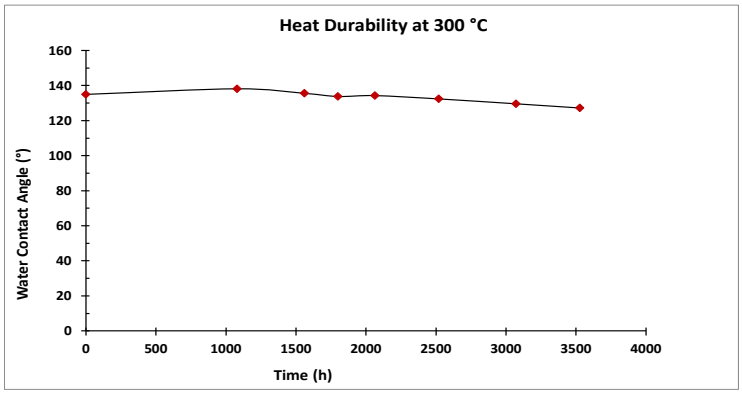

Figure 3. The heat durability of the HTS coated polarizer was demonstrated by plotting the water contact angle during exposure to 300°C. Parts maintained a WCA > 120° for over 3,500 hours.

Minimum Optical Impact

The HTS coating has very little performance impact to the overall performance of the wire-grid polarizer. As shown in Table 1, the performance impacts are minimal.

Optical Parameters	Performance Impact of HTS-coat
P-Transmission (Tp) 550nm	-1.5%
S-Transmission (Ts) 550nm	+0.03%
P-Reflection (Rp) 550nm	-0.9%

Table 1. Performance Impact of HTS Coat.

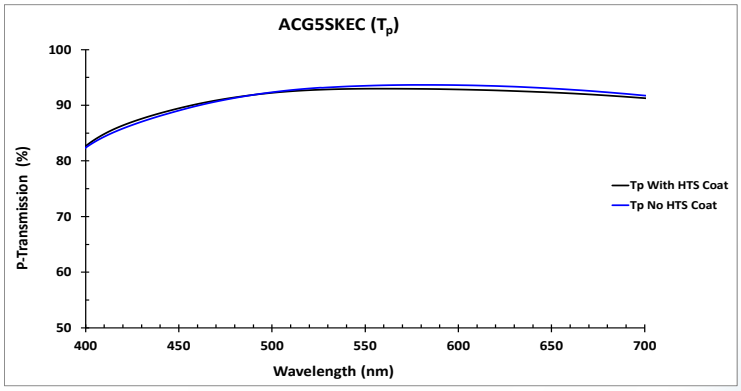

Figure 4. Minimal Tp Performance Impact of HTS Coat.

Conclusion

The HTS hydrophobic coating was developed to protect wire-grid polarizers when exposed to harsh environmental conditions where water and oil droplets are present. This coating is thermally stable at temperatures up to 300°C for over 3,500 hours with very little performance impacts.

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