Hard Protective Coating for Wire-Grid Polarizers

Overcoat Coating Technical Note

Introduction

MOXTEK's inorganic wire-grid polarizers provide excellent polarization performance and are designed to tolerate high temperatures. Wire-grids structures are extremely small and will be damaged if touched or cleaned.

Moxtek has developed the proprietary Overcoat coating to protect the wire-grid surface. This coating provides mechanical support and durability to the wire-grid surface allowing for gentle wiping and cleaning. The Overcoat is also thermally stable at temperatures up to 300°C for over 1,000 hours with minimal performance impact.

Product Name	Description
RCV8LCET	High contrast visible reflective polarizer with protective Overcoat™
RCV6LCET	High transmission visible reflective polarizer with protective Overcoat™
GCG8LGER	Balanced green absorptive polarizer with protective Overcoat™
BCU7GCE1 (PBS02A+OC)	Standard PBS-No AR, with Protective Overcoat™

Table 1: Overcoat product descriptions

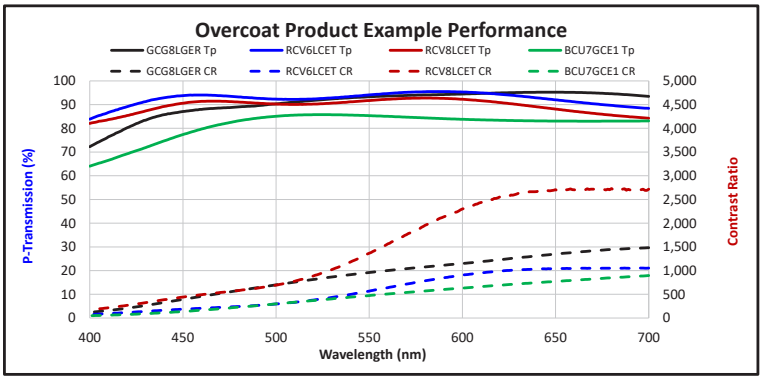

Figure 1: Optical Performance

Mechanical Abrasion Testing

Polarizer plates were "rub" tested using various abrasion tools. Moxtek used a moderately abrasive cheese cloth brush and rubbing method as defined by MIL-C-48497. This testing included the following rubbing tools: moderate rubbing tool with cheese cloth tip, paintbrush, cotton swab, alpha wipe, and beta wipe (see Figure 2 below). The rubbing angle and pressure used is defined in MIL-C-48497.

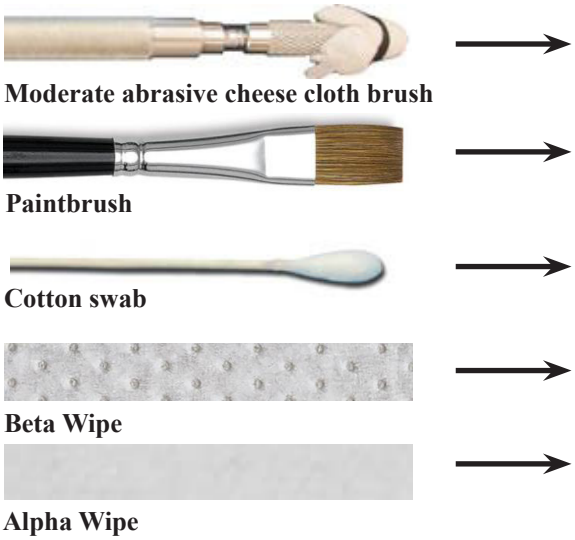

Figure 2: Rubbing tools

Polarizer <u>with</u> Overcoat

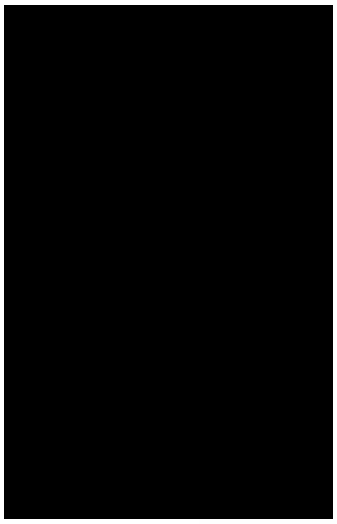

Figure 3a: <u>No damage</u> to the wire-grid surface from rubbing tests.

Polarizer <u>without</u> Overcoat

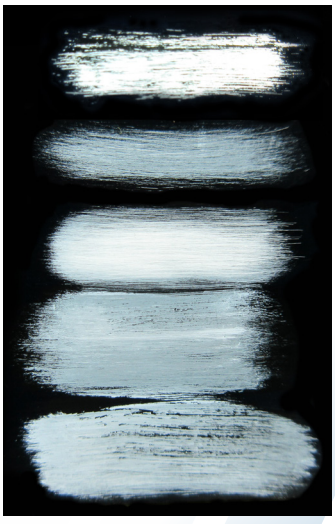

Figure 3b: <u>Severe damage</u> to the wire-grid surface from rubbing tests.

Rubbing method: ~1lb force, 20 strokes in a straight line, Approximately 9 lb/in^2

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Adhesion Test

Clear adhesive tape was applied to the wire-grid surface of a sample with Overcoat and one without Overcoat. The tape was then removed and the results are shown below. The polarizer with Overcoat did not have any visual or optical performance damage after the tape pull test whereas the polarizer without Overcoat was severly damaged.
See Figures 4 below.

Figure 4a: No damage to the wire-grid surface from tape-pull test.

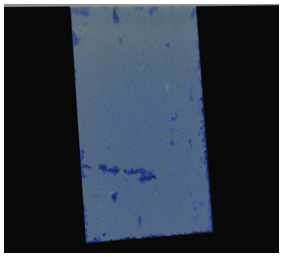

Figure 4b: Severe damage to the wire-grid surface from tape-pull test.

Chemical Resistance

Cleaning solvents (methanol and isopropyl alcohol) were applied to the wire-grid side of polarizers with the Overcoat treatment. These parts and solvents were placed in a closed system for an hour and then allowed to dry at room temperature overnight Optical performance measurements were taken before and after the exposure with no change visual or optical performance degradation. Moxtek does not recommend applying solvents to wire-grid polarizers without overcoat. Also, Moxtek does not recommend applying acetone to any wire-grid polarizers, with or without overcoat.

Conclusion

The Overcoat was developed to protect wire-grid polarizers from mechanical stress caused by gentle wiping and cleaning. This coating has been demonstrated to provide protection for processes and applications that require parts to be handled gently or cleaned. Customers should not press on the Overcoated wire-grid polarizer with excessive force or use abrasive materials otherwise damage is possible.

Optical Parameters	Typical Performance Impact of Overcoat
P-Transmission (Tp) 550nm	(2-4%) lower
S-Transmission (Ts) 550nm	(.02-.04%) higher
P-Reflection (Rp) 550nm	(0.5-1.5%) lower
S-Reflection (Rs) 550nm	(0.5-1.5%) higher

Table 2: Performance Impact of Overcoat

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