

Hard Protective Coating for Wire-Grid Polarizers

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 1000 hours with minimal performance impact.

Mechanical Abrasion Testing

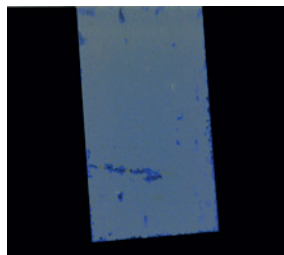
Polarizer plates were "rub" tested using various abrasion tools. Moxtek used a moderately abrasive cheese cloth brush and rubbing method as defined by MIL-C-48497. This testing included the following rubbing tools: moderate rubbing tool with cheese cloth tip, paintbrush, cotton swab, alpha wipe, and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

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 severely damaged. See figures below.



No damage to the wire-grid surface from tape-pull test.



Severe damage to the wire-grid surface from tape-pull test.

Chemical Resistance

Cleaning solvents (methanol, acetone, and isopropyl alcohol) were applied to the wire-grid side of polarizers with the overcoat treatment as shown in Figure 5. 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 clean wire-grid polarizers that do not have the overcoat coating.

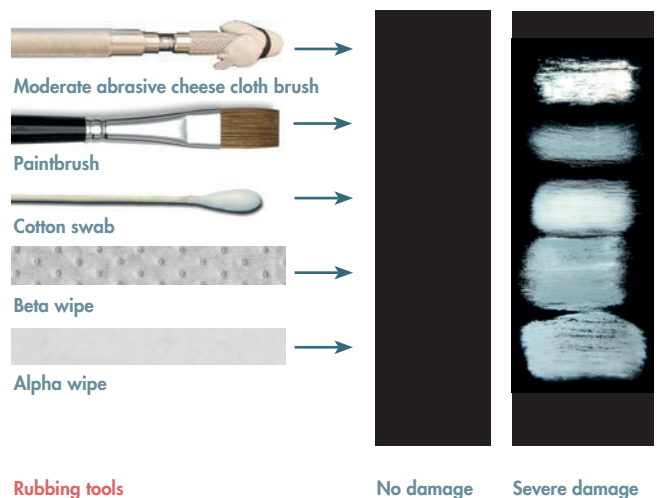
Performance impact of overcoat	
Optical parameters	Performance impact
P-Transmission (Tp) 550 nm	-1.9%
S-Transmission (Ts) 550 nm	+0.03%
P-Reflection (Rp) 550 nm	-0.5%
S-Reflection (Rs) 550 nm	-0.5%

Conclusion

The overcoat coating 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.

Note: Uncoated wire-grid polarizer surfaces should never be touched or cleaned, otherwise the ribs will be destroyed. The overcoat coating will provide protection from light touching cleaning if necessary but it is always good practice to not touch if possible. Moxtek recommends using gloves when handling polarizers so oils and fingerprints are not left on the overcoat surface.

Damage to the wire-grid surface from rubbing tests. Rubbing method: ~1lb force, 20 strokes in a straight line, Approximately 9 lb/in²



Rubbing tools

No damage

Severe damage