Application Note

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Hard Choices: Decontamination of Plastic Surfaces with UVC Light[1]

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BENEFITS

- No touch
- Residue free
- Inactivation in less than 5 minutes
- Long lasting solution - lamps last upwards of 10,000 hours
- Applicable to biomolecules and microorganisms

KEYWORDS

Pharmaceutical, food, manufacturing, RNase, UVC inactivation, enzyme activity, UV LED, reflectivity, contact surface

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Introduction

The germicidal effect of ultraviolet-C (UVC) light has proven effective as a no-touch, fast, and residue-free solution[2] against microorganisms and biomolecules. UVC disinfection and decontamination is dependent on the material and contaminant being subject to treatment. This application note compares partial RNase A inactivation (as a model[3]) with identical UVC light doses on two surfaces to identify differences in material susceptibility to UV light. 278 nm was the wavelength chosen due to its effects on proteins shown in previous Phoseon studies[2,4].

Methods

Surfaces Treated:

- PETE and Polyolefin

Equipment and reagents:

- Phoseon KeyPro™ Industrial Lamps
- RNase activity fluorescence/kinetics assay (RNaseAlert IDT)
- Fluorometer Gemini II (Mol. Devices)
- RNase A (2 µl, 0.02 units/ml, Worthington Biochemical)

Both surfaces were inoculated with RNase A in duplicate and were left to dry. One sample surface from each material was treated with UVC light and the other was used as an RNase A recovery control.

UVC Light Treatment

Wavelength	Lamp Intensity	Time	Distance from lamp	Dosage
278 nm	330 mW/cm^2	30 s	25 mm	9.9 J/cm^2

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Dosage was purposely chosen to observe partial enzyme inactivation levels and therefore obtain information on subtle enzyme-surface dynamics. Rnase A was recovered from both untreated and treated samples in 60 µL of RNase-free water, and the suspension was tested in an RNase activity fluorescence and kinetics assay (RNaseAlert IDT) for 1 hour. The reduction of activity was assessed. Fluorescence was determined on a Gemini II (Mol. Devices) of the UV exposed samples as a recovery percentage from the untreated control surface.

Results

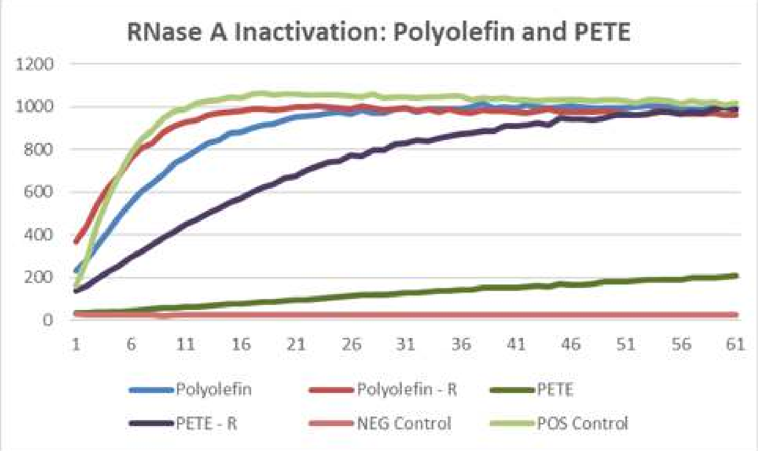

Figure 1. Partial RNase A inactivation in Polyolefin and PETE. PETE showed substantial enzyme inactivation while Polyolefin responded poorly to this dosage of UVC light. Polyolefin-R and PETE-R were untreated controls to show RNase A recovery for each surface.

Conclusion

PETE and Polyolefin are commonly used plastics in packaging and manufacturing. While full inactivation of microorganisms and biomolecules using UV-C light is achievable on both surfaces, relevant treatment differences must be noted. According to the results in Figure 1, Polyolefin will require higher dosages of UVC light than PETE. This information is particularly useful to the food safety and pharmaceutical industry, showing that not all surfaces will require the same conditions for UVC disinfection and decontamination.

Literature Cited

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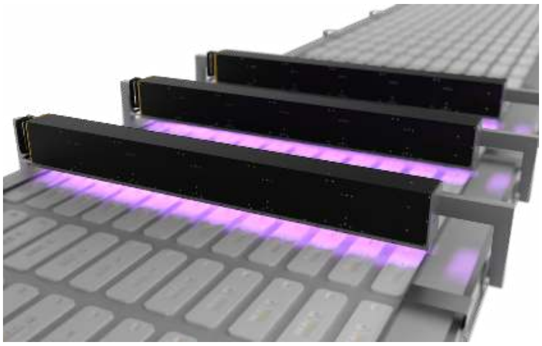

KeyPro™ Industrial Lamps

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