Damage to Common Healthcare Polymer Surfaces from UV-C Exposure

Peter Teska[1*], Roderick Dayton[1], Dr. Xiaobao Li[1], Jason Lamb[1], Phillip Strader[2]

[1] Diversey Inc, Fort Mill SC, USA
[2] North Carolina State University, Raleigh NC, USA

Healthcare associated infections are a significant concern in acute care facilities across the US.[1] Studies have shown the importance of a hygienic patient environment in reducing the risk of such infections.[2,3] This has caused an increased interest in ultraviolet light disinfectant technology as an adjunct technology to provide additional pathogen reduction to environmental surfaces and patient care equipment (i.e. surfaces).[4-6] It is also well known that ultraviolet light (UV-C) can cause premature degradation of materials, particularly certain plastic materials.[7-11] However, there is little information in the literature regarding characterizing this degradation of plastics and other materials used for surfaces in healthcare. This study evaluated ten grades of plastic materials using the multiple characterization techniques discussed previously.[12-13] All characterization methods were able to identify one or more specific degradation features from UV-C exposure covering different aspects of physicochemical properties of the surfaces (example data below). However, these methods showed different sensitivity and applicability to identify the onset of surface damage. Different types of surface materials showed different susceptibility and modes to degradation upon UV-C exposure. From these data a systematic approach to further understand early onset degradation of plastics due to UV-C exposure is proposed.

Change in Root Mean Square (Sq) surface roughness (+/- SD) in select plastics after UV exposure.

Sample	L*a*b, ΔE Value	ASTM Whiteness, % Change
ABS	3.28	-12.23
White acrylic	10.66	-48.83
Clear acrylic	0.12	-0.49
Delrin	1.54	-7.10
Nylon	2.67	-9.45
PC	3.89	-17.52
PET	1.15	-5.82
PP	0.12	-0.51
Teflon	0.66	-3.37
UHMW	0.74	-3.04

Change in color for select plastics after exposure to UV energy.

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