Proposed IUVA Task Force in

Understanding the Impacts of UVC Exposure on Polymer Degradation

Proposed by: Dr. Kyle O'Connor, Jerry Eng, Sophie Poelmans

Solvay; Email: kyle.oconnor@solvay.com, jerry.eng@solvay.com, sophie.poelmans@solvay.com

UVA and UVB light (290-400 nm) exposure is known to cause degradation to various polymeric materials. The fact that UVC light causes skin damage in case of direct exposure is also well documented, so there is reason to suspect UVC light to have deleterious effect as well on surfaces.

Disinfectant and sterilization technology based on the application of UVC light (200-280 nm) has gained significant traction following the COVID 19 pandemic. The efficacy of UVC light in the destruction of bacteria and viruses has been shown throughout the literature and in commercial practices. Although there is much precedent on the impacts of UVC light regarding biological species, there is much less work focusing on the impacts of UVC light on material surfaces. We would like to develop a fundamental understanding of the impacts of UVC light exposure on the degradation behavior of various polymer classes and identify the necessity for advanced UV stabilization technology that can minimize this effect. Considering the rapid rise of UVC disinfectant technology, these fundamental studies could prove to be highly valuable across various industries.

Scope

This task force will focus on developing fundamental knowledge and understanding of the impacts of UVC exposure on the degradation of various polymeric materials.

Process

This task force will utilize the taskforce team members' assets (processing equipment, UVC lamp exposure systems, and analytical tools) to answer several key questions regarding polymer degradation, some of which are listed below:

1. Does UVC exposure have an impact on various polymeric material?
2. How much UVC exposure energy does it take to observe both a chemical and physical change in various polymeric materials used in transportation (trains, busses, automobiles, metro, airplanes), healthcare industry (hospital furniture, housing devices) and high contact surfaces (supermarkets, shopping trolley, security lanes)?
3. What is the nature of the chemical change of a material after UVC exposure and how does the material class impact the change?
4. How do standard UV stabilizer systems impact UVC induced polymer degradation?
5. Can we formulate a UVC testing protocol framework for polymeric material degradation to lead into further discussion with ASTM & ISO to set standard testing methodologies?

Deliverables

The initial milestones proposed for developing a fundamental understanding of UVC light impact of materials surfaces are:

1. Developing experimental roadmap and corresponding data for addressing fundamental degradation questions: (end Sept'21)

2. Create the degradation profile of various polymeric materials and determine the ranking by degradation level induced by UVC light: (end Feb'22)

3. Deliver a draft framework of test protocols on degradation of polymeric materials from UVC exposure for potential further discussion with ISO and ASTM: (end Feb'22)

4. Present findings to industry in a IUVA sponsored conference and other polymeric material conferences: (June '21)

Participating Members

Matthew McGreer	Ametek
Richard Simons	Aquisense
Jennifer Pagan	Aquisense
John Harris	Boeing
David Harbourne	Consultant
Paul Uglum	Consultant
Arthur Kreitenberg	Dimer
Peter Teska	Diversey
Torsten Jenek	Heraeus
Jan Winderlich	Heraeus
Stephen Yates	Honeywell
Gary Cohen	IUVA
Chris Rockett	Light Sources
Gareth John	Lighting Industry Association
Sepas Setayesh	Philips Healthcare
Cees Ronda	Philips Healthcare

Robert Karlicek	Rensselaer Polytechnic Institute (RPI)
Colin Mikulec	RTP Compounding
Marko Hofmann	Seoul Viosys
Richard Garrett	Signify
Femke Megens	Signify
Jaak Geboers	Signify
Henri Jagt	Signify
Jerry Eng	Solvay
Sophie Poelmans	Solvay
Sari-beth Samuels	Solvay
Robert Groenhagen	Solvay
Kyle O'Connor	Solvay
Benjamin Frischknecht	SterilAir
Simon Schlegel	SterilAir
Mike Bean	Uniphy
Ryan Olsen	Ushio
Holger Claus	Ushio
Mark Stibich	Xenex
Sarah Simmons	Xenex

Task Force Lead

Kyle O'Connor, Ph.D.

Solvay

Tel: 203-321-2305

Email: kyle.oconnor@solvay.com

Resource Requirements

Polymeric material suppliers (Pending Solvay 3rd party invitees)

Processing equipment (extruder, injection molding equipment): Solvay + Team members

UVC lamp exposure systems: (TBD)

Analytical tools (Solvay + Team members)