



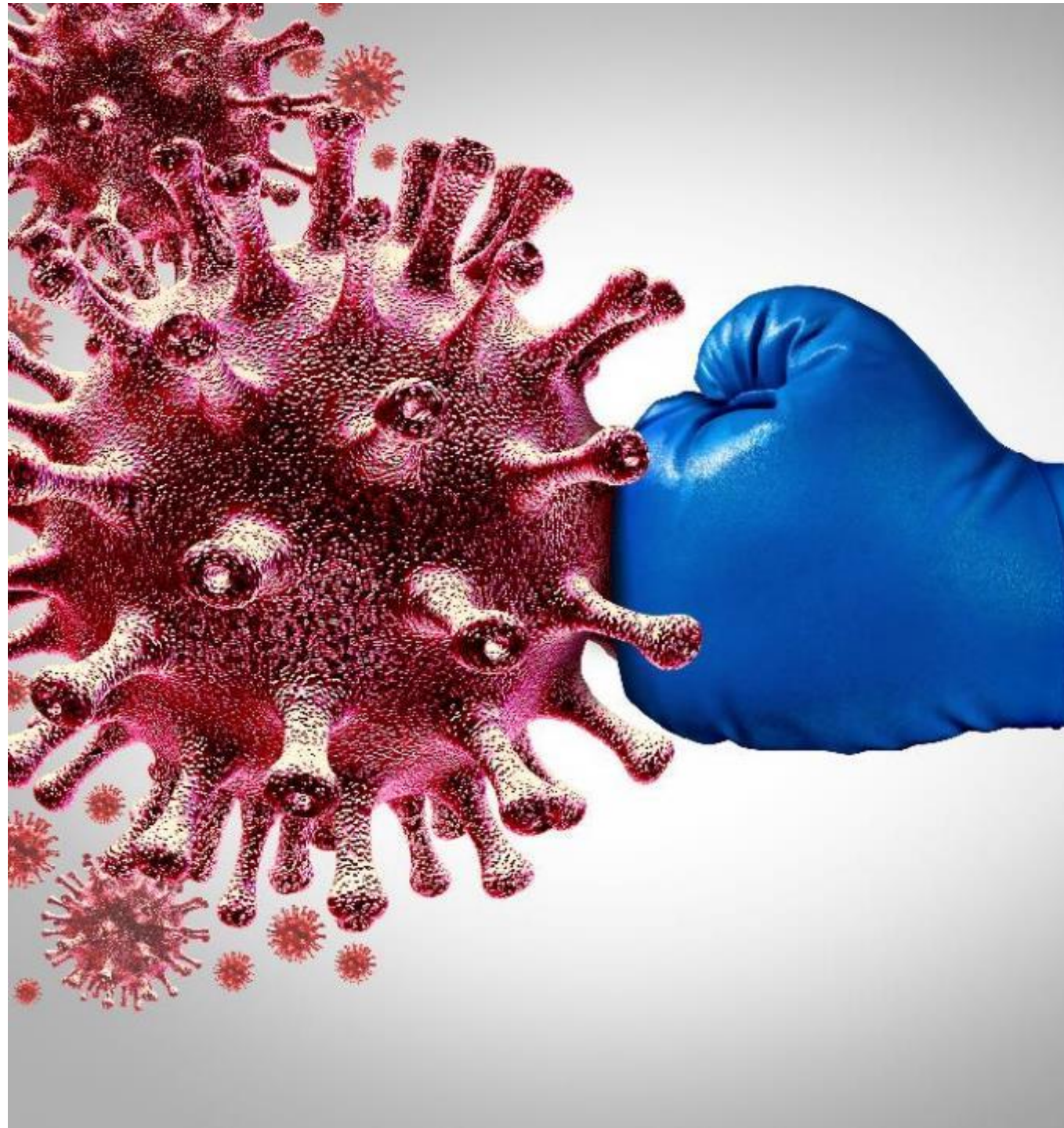
Progress beyond



An Introduction to the International Ultraviolet Association - IUVA

2022 Plastics in UVC Sterilization
SPE National Week of Coloring Plastics

Sophie Poelmans, Jerry Eng, Gary Cohen



Agenda

1. IUVA

- IUVA Vision, Collaborations, Active Task forces

2. Impact of UVC on Material Degradation

- What is the difference between UVA/UVB/UVC?
- Taskforce Objective
- Methodology
- Timeline

3. Q&A



IUVA – International Ultraviolet Association



- A not-for-profit, educational association
- 32 countries represented
- Member profile:
 - Leading utilities
 - Regulators
 - Academicians
 - Consulting engineers
 - Manufacturers
 - End users



- Drastic increase in membership since April 2020

IUVA Vision:

To advance the science, engineering and applications of ultraviolet technologies to enhance the quality of human life and to protect the environment

Collaborations & MOU



Memoranda of Understanding with other professional associations working in UV:

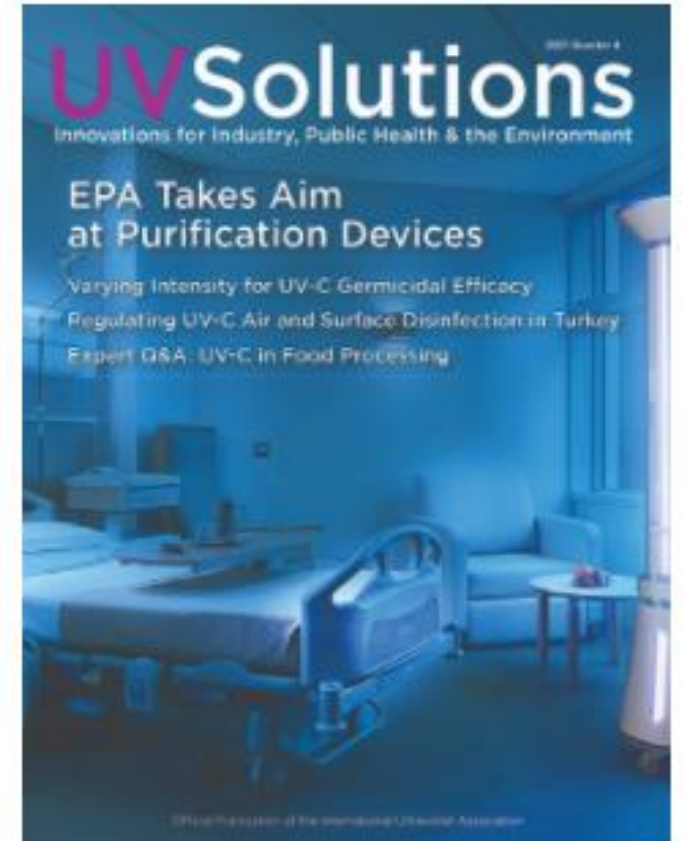
- The newly formed Chinese Ultraviolet Association (CUVA)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- Illuminating Engineering Society (IES)
- National Electrical Manufacturers Association (NEMA)
- European Photonics Industry Consortium (EPIC)
- Global Lighting Association (GLA)
- National Institute of Standards and Technology (NIST)



Upcoming Events & Publications




- 2022 IUVA Research Innovation Symposium, May 23-25, Bolder, Colorado
- 2022 IUVA Americas Conference, September 26-28, Cincinnati, OH
- UV Solutions Quarterly Digital Magazine
 - the official publication of The International Ultraviolet Association (IUVA)
 - Worldwide readership by engineers, manufacturers, academics, government officials and policymakers who are concerned with the use of ultraviolet technology
- Educational Webinars available on www.iuva.org



Active IUVA Task Forces



- Historical focus on water purification
- Active task forces that get into special topics of current importance, such as:
 - UV for Biofilm Control Task Force
 - Industrial Water Task Force
 - Far UVC Radiation for Disinfection of Air and Surfaces
 - UN Sustainable Development Goals Task Force
 - Healthcare/HAI Working Group
 - UV-Solutions for Food and Beverage
 - UV LED Technologies & Applications
 - OH scavenging protocol
 - UV measurement underwater & Industrial water standards
 - Canadian regulation and UV-C devices
 - ***Impact of UV-C on Material Degradation*** 

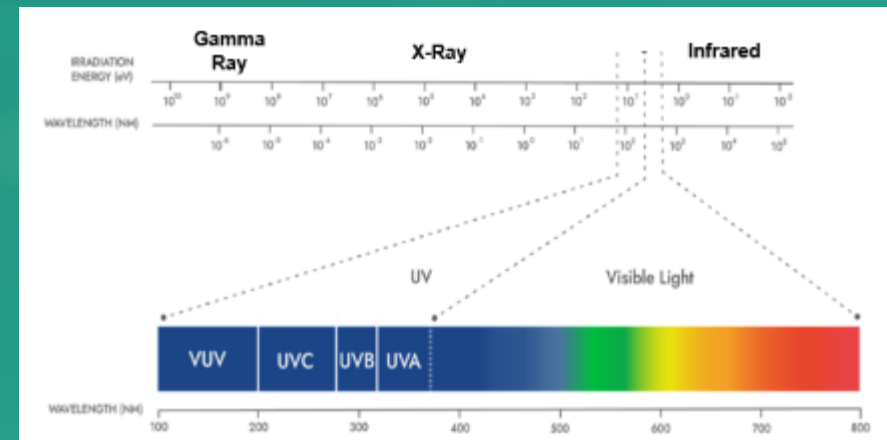


What is UVC Disinfection



Sanitizing/Disinfecting Measures

- Wipe/Spray Surfaces – Sanitizing Chemicals
- Wipe/Spray Surfaces – Disinfecting Chemicals
- UVC Disinfection



UVA/UVB versus UVC

- It is well established that polymeric materials are susceptible to surface and bulk degradation after prolonged UV exposure (specifically UVA and UVB irradiation from the sun)
- The Earth's atmosphere filters out UVC irradiation from the sun, so less is known about the impacts of UVC irradiation on polymeric materials
 - There are fewer controlled studies available for UVC exposure of plastic materials
- As UVC technology has expanded, questions about its impact on materials have also expanded

UVA/UVB exposure



UVC exposure



before exposure

after exposure





PURPOSE

1. Provide a shared understanding for the impacts of various UV-C disinfection technologies on polymeric materials through the development of meaningful scientific data.
2. Develop testing protocols to establish a framework for standardizing UV-C exposure testing of polymeric materials.

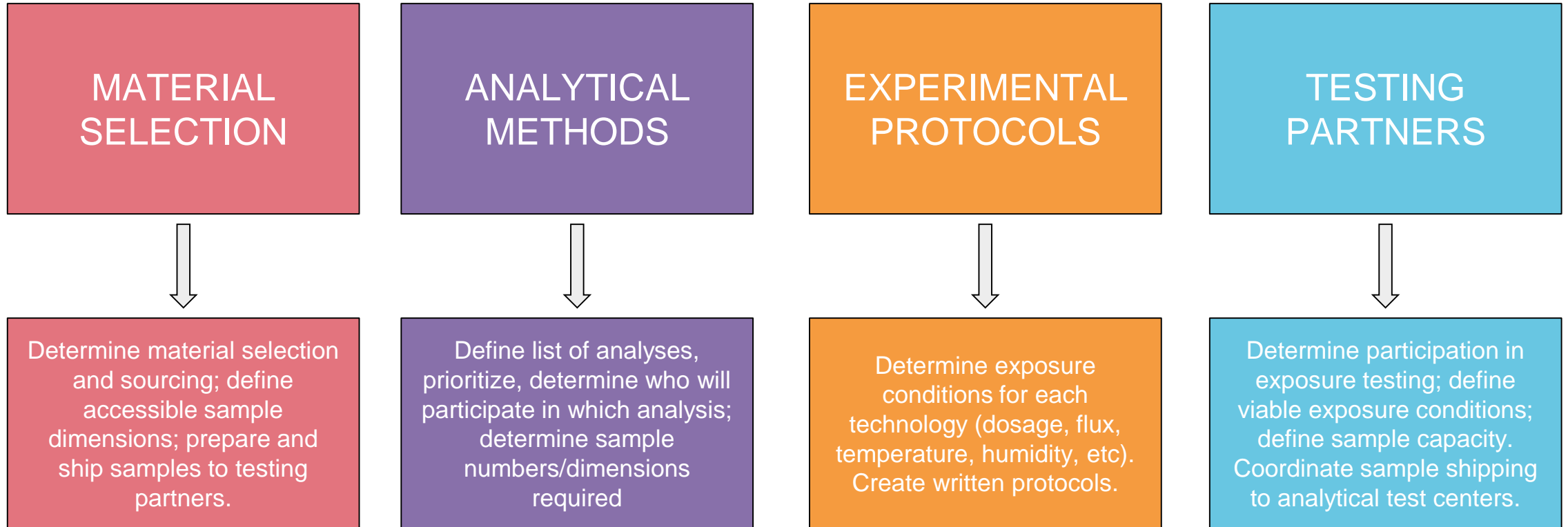
SCOPE

1. Polymeric materials which commonly encounter UV-C disinfection.
2. UV-C disinfection technologies broadly used for surface disinfection.
3. Analytical techniques which capture relevant changes to the materials.
4. Round robin testing to evaluate consistency of results between different technologies.

A Cross-Industry Union of Task Force Members



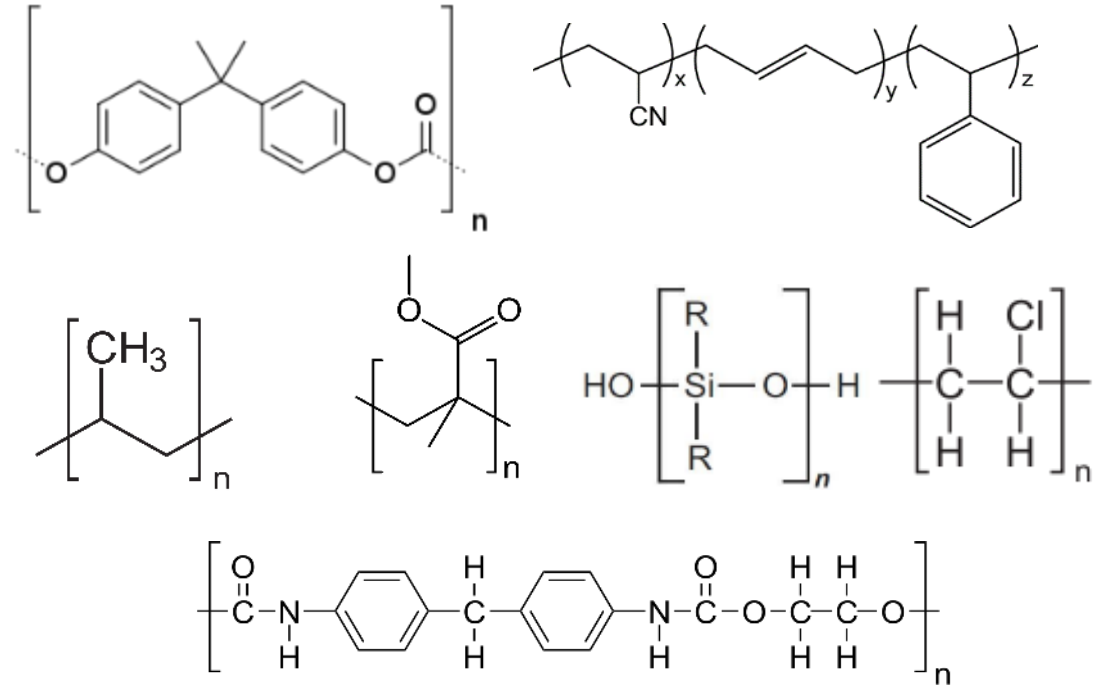
IUVA Task Force Sub-Team Methodology



Phase 1 Material Selection



1. Polycarbonate (PC)
2. Acrylonitrile-Butadiene-Styrene (ABS)
3. Polypropylene (PP)
4. Poly(methyl methacrylate) (PMMA)
5. Polyvinyl Chloride (PVC)
6. Polysiloxane
7. Thermoplastic Polyurethane / Thermoplastic Elastomer



7 materials have been selected to understand the behavior of the unformulated polymer systems most commonly used in diverse applications.

Phase 2 Material Selection

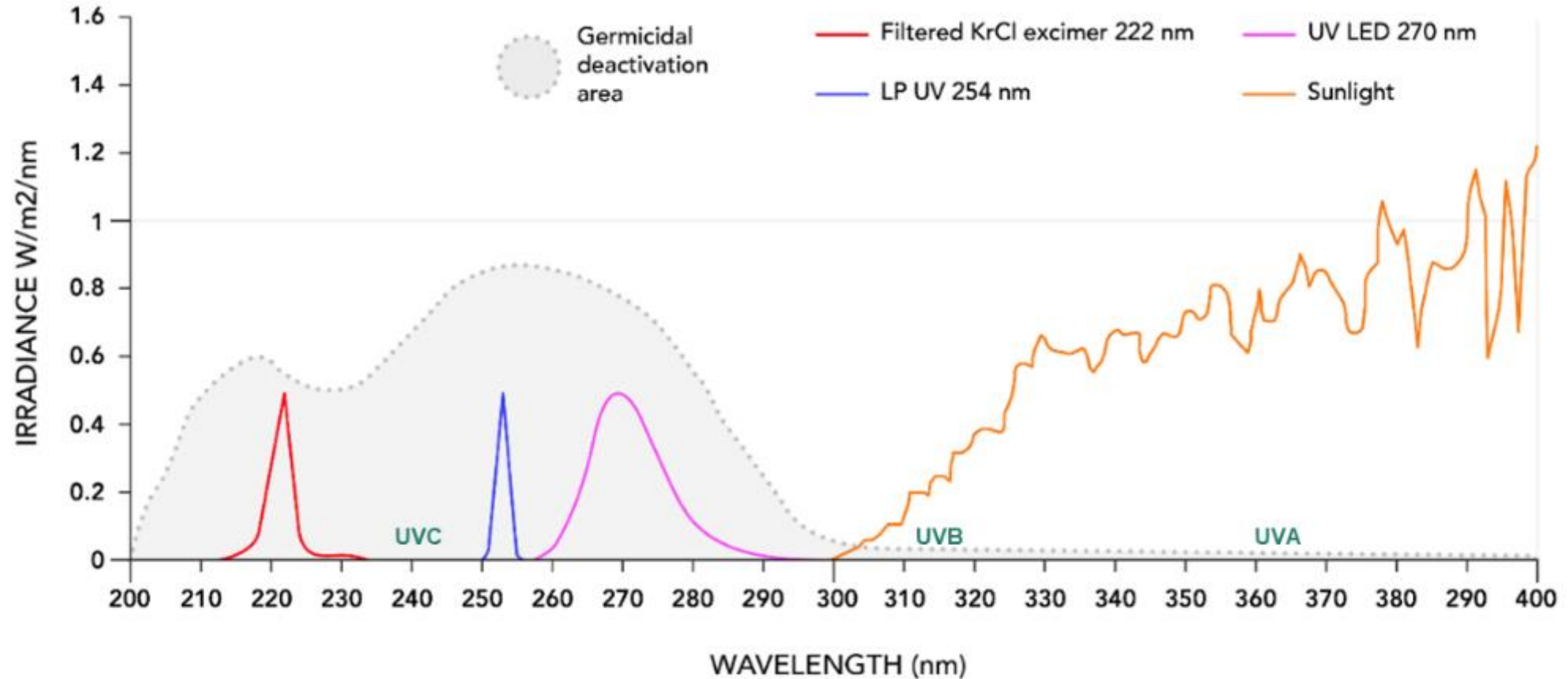


1. Antistatic PMMA
2. Makrolon 2558 - PC
3. PVC commercial grade
4. Kydex 6565 – Acrylic modified high impact PVC
5. Lexan ML 4539 - PC
6. Lexan FST 9705 - PC



6 commercial grade polymer systems have been selected based on their prevalence in specific market segments and diversity of chemical structures.

UVC Light Technologies Selection



3 different UVC light technologies that emit light at 3 different wavelengths in the germicidal deactivation area were included.

Analytical Test Method Selection



A Total of 18 Unique Analytical Test Methods were Brainstormed

Analytical Test Assessment

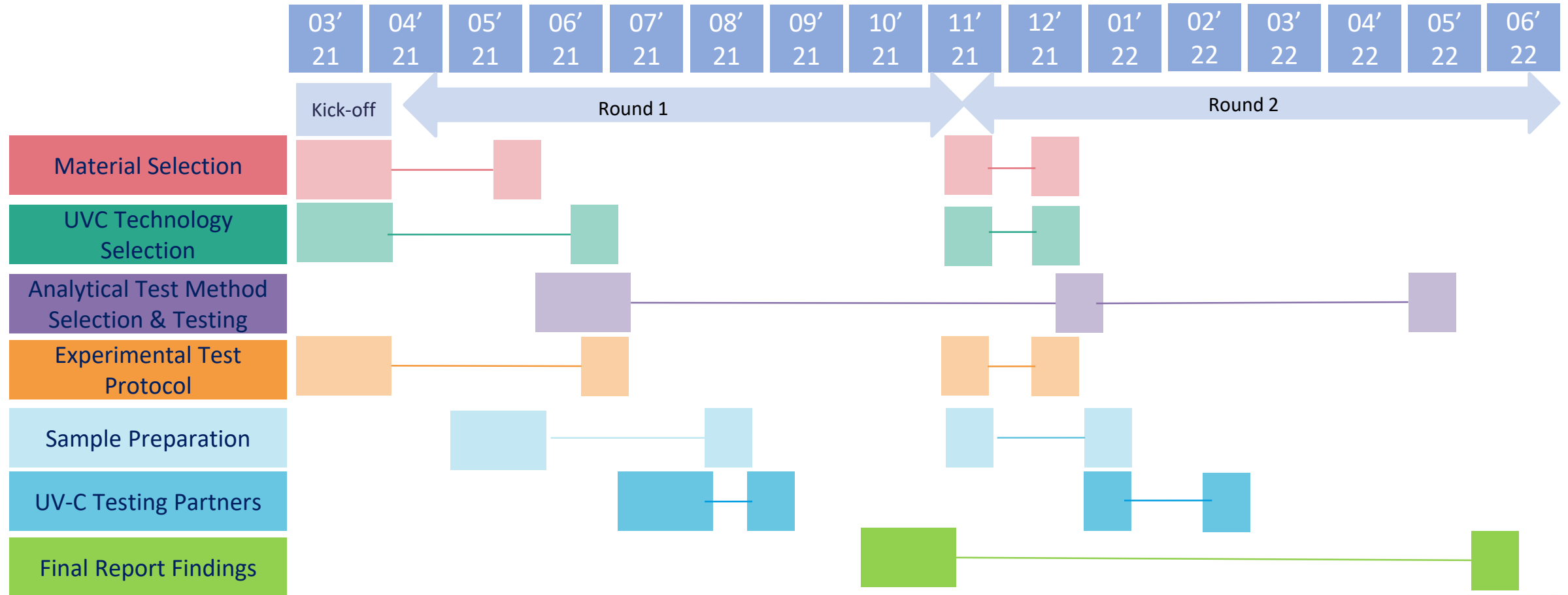
Ease of Test	Low Importance Easy Test	Important Easy Test
	Low Importance Not Easy	Important Not Easy
	Importance of Test	

Selected Test Methods:

- Color and gloss measurements
- Mechanical stress (stress/strain) performance
- Optical microscopy
- Survey of reflectivity pre and post UVC exposure
- Transmission color change (transparent polymers: PC, PMMA, etc)
- Transparency Haze
- Flame retardancy

7 unique analytical test methods were selected and performed at duplicate test sites.

Timeline/Progress



Q&A



Thank You