Lightfastness and Weathering Durability Testing Techniques

CEEES Seminar

'European Reliability and Environmental Testing Connected'

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ATLAS MATERIAL TESTING SOLUTIONS

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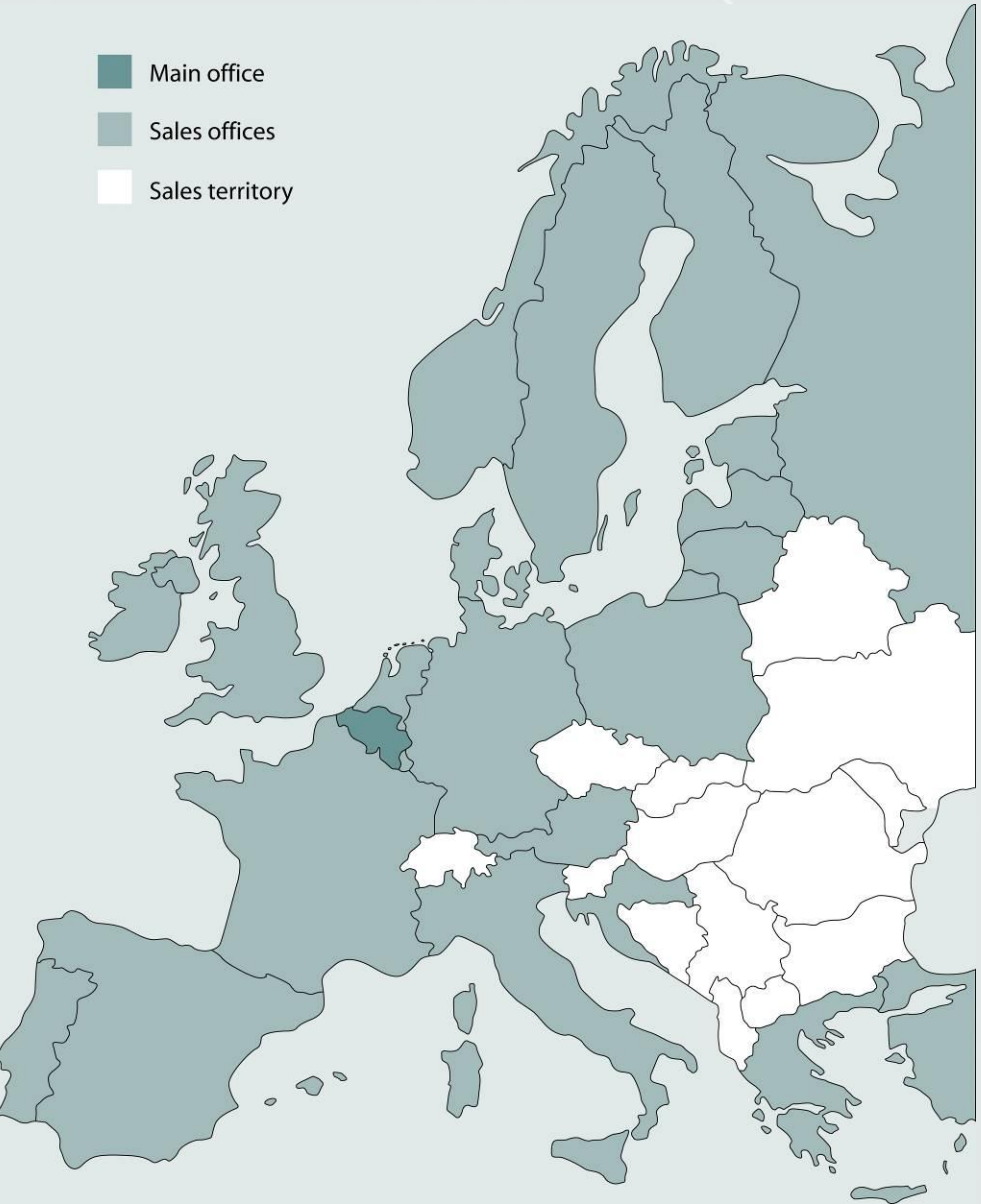

- Rycobel is an exclusive distributor of testing equipment for quality control and is specialized in the optimization of production processes on the shop floor across all industries.
- All over Europe
- ISO 9001-2008

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HISTORY

- 1950 : Roots in Textile
- 1960 : Exceeding sector limitations – static electricity
- 1970 : Testing equipment and equipment for quality control - Export
- 1980- 1990 : Product range and market grow further (textile, plastics, packaging, …)
- 2000-2010 : Extend business unit : optimization of production processes.
- 2006 : Establishment Equintech SARL (France)
- 2008 : ISO 9001:2008 Certificate
- 2010 : Take over activities of Atlas BV Netherlands and establishment Rycobel BV Netherlands

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WEATHERING vs LIGHTFASTNESS

- **Weathering**

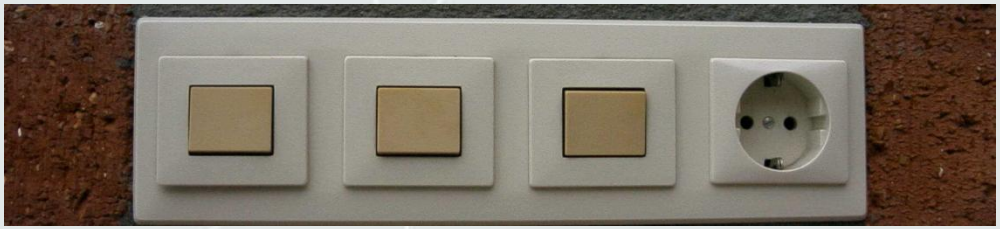
Weathering is the adverse irreversible response of a material or product due to climate

= Ageing

- **Lightfastness**

The resistance to color change when exposed to a light source

= Fading



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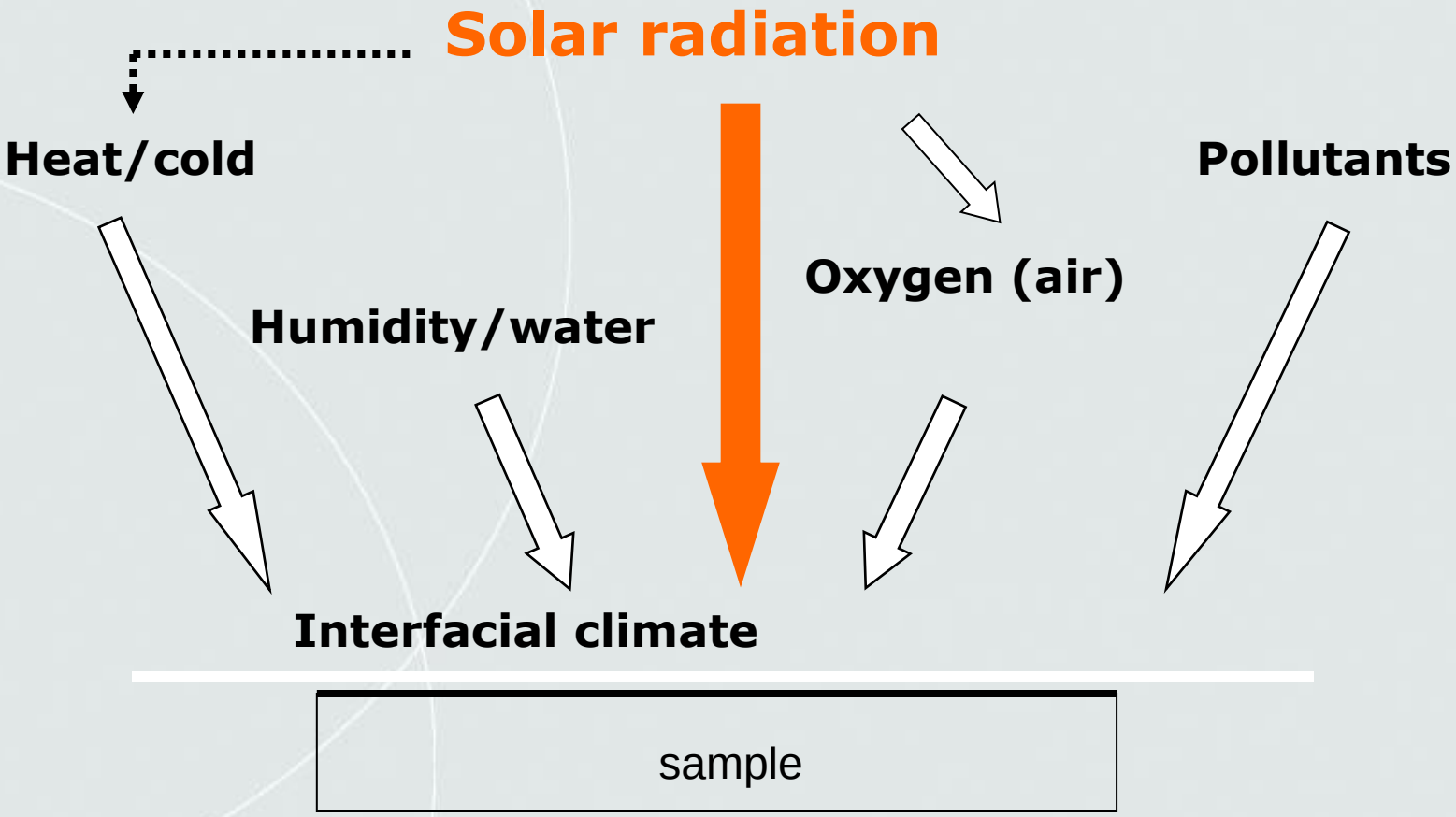
WEATHERING FACTORS



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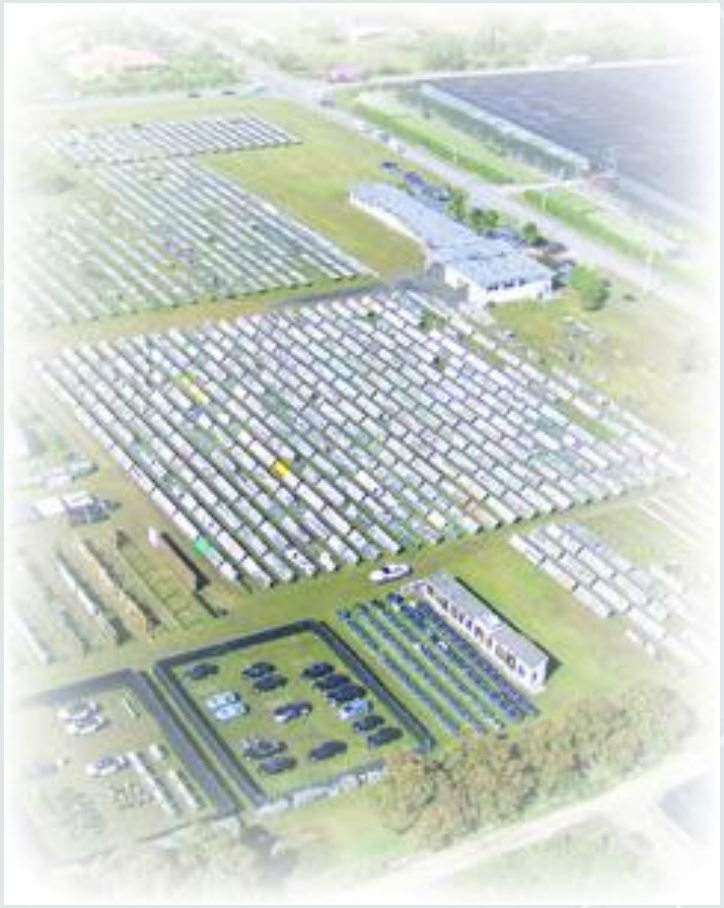
NATURAL WEATHERING



= Realistic but time-consuming

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LABORATORY WEATHERING

Desirable Characteristics:

- Exact match to outdoor conditions
- Does not alter degradation mechanisms; i.e. “correlates” with outdoor exposures
- Repeatable and reproducible
- Independent control over stress factors
- Provides “acceleration” over real time
- Service life prediction

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LABORATORY WEATHERING

MAJOR PARAMETERS FOR WEATHERING TESTS

- Spectral distribution and irradiance
- Surface temperature
- Test chamber temperature
- Relative humidity
- Cycles (rain phase – light / dark phase)
- Monitoring and control of all parameters
- Calibration of the measuring instruments

Standard = agreement between client and supplier

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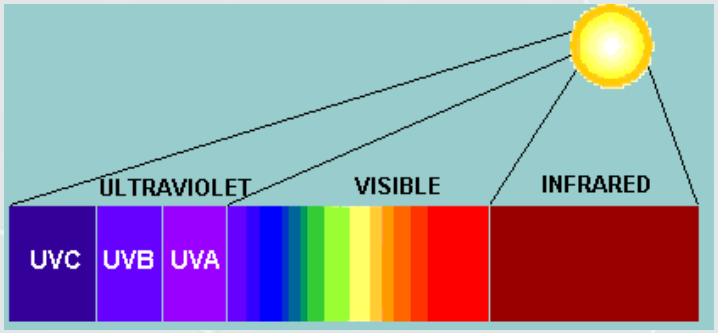
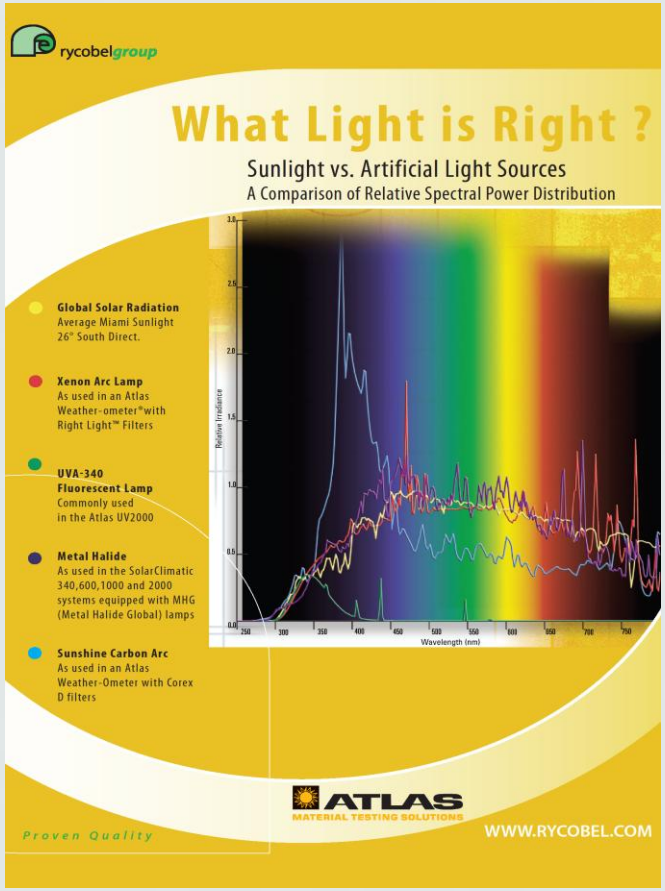
LABORATORY WEATHERING

WHAT LIGHT IS RIGHT



Spectral Range		Wavelength [nm]	Irradiance [W/m²]*		[%] of Total Solar*
UltraViolet (UV)	UV-B	~280-320nm	4,06 W/m²	74,56 W/m²	6,8%
	UV-A	~320-400nm	70,5 W/m²		
Visible		~400-800nm	604,22 W/m²		55,4%
Infrared (IR)		~800-2450nm	411,62 W/m²		37,8%
Total		~280-2450nm		1090,40 W/m²	100,0%

*in accordance to CIE Pub. 86, Tab4



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LABORATORY WEATHERING

WHAT LIGHT IS RIGHT

Filter combinations for water-cooled Xenon lamps

Inner filter glass	Outer filter glass	Test conditions
Boro-silicate “S”	Boro-silicate “S”	Most common combination for weathering tests / Outdoor conditions
Quartz	Boro-silicate “S”	Weathering tests with somewhat more and shorter UV than sunlight (presence of UV-C)
Quartz	Quartz	Weathering tests with considerably higher and shorter UV than sunlight – for extreme requirements only -
Borosili-cate “S”	Soda Lime	Most common combiantion for lightfastness tests behind window glass

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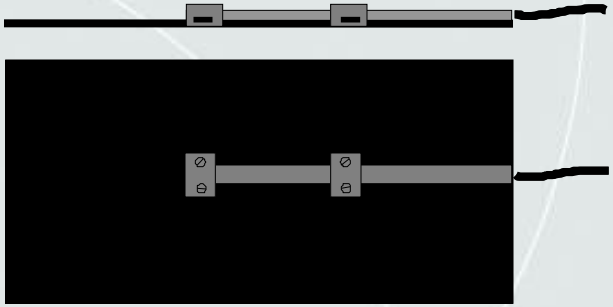
LABORATORY WEATHERING

SURFACE TEMPERATURES

Black Panel BPT (SAE)



Black Standard BST (ISO)

T1° **<** **T2°**

The temperaturedifference between BST and BPT can be 5°C to 8 °C due to the thermal isolation of the BST

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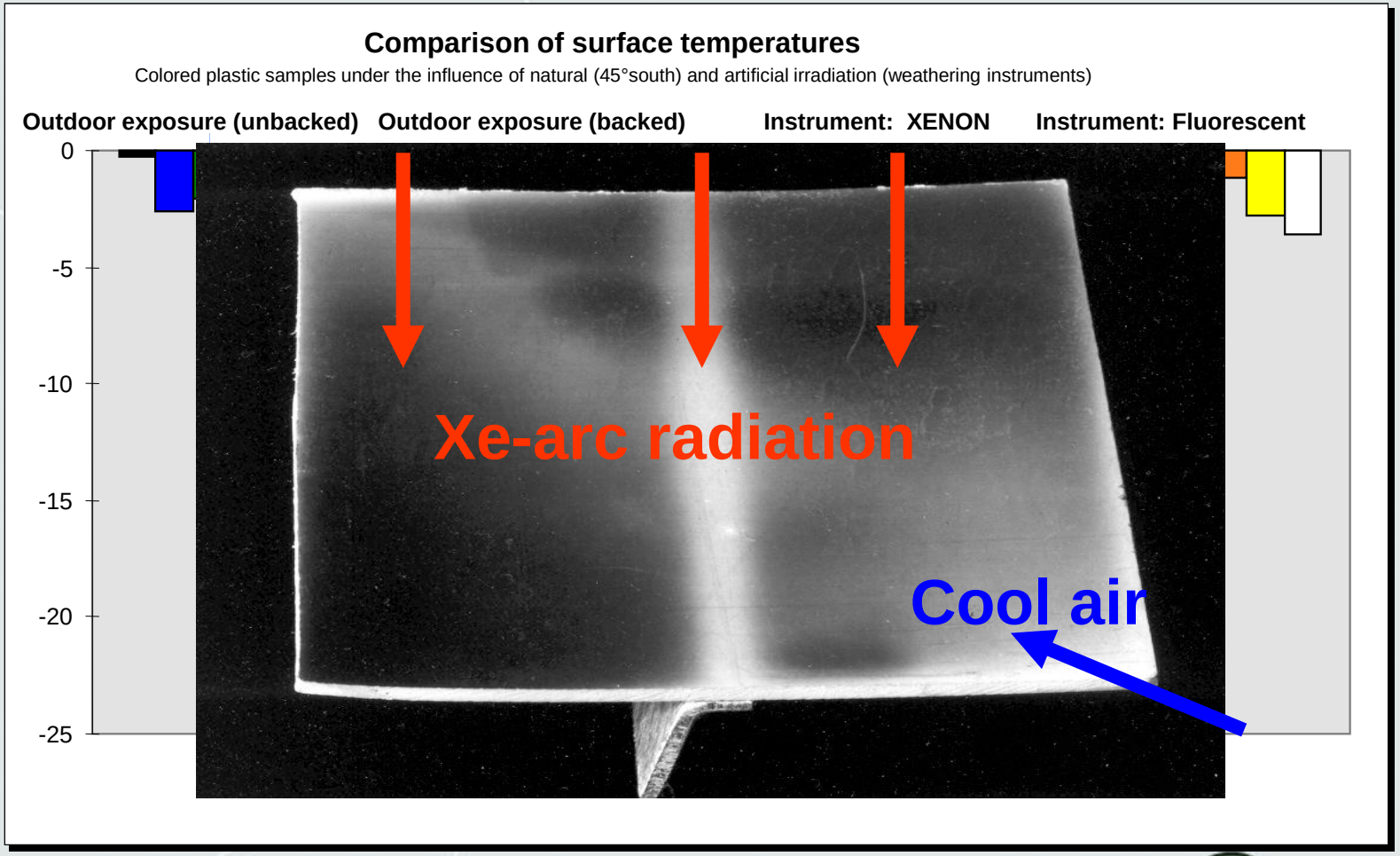
LABORATORY WEATHERING

SURFACE TEMPERATURES



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CORRELATION AND ACCELERATION

H (MJ/m²) [1] Spectral Range (nm)	Global 295-3000	UV 295-400	Exposure Time [h] [2]	Time Factor [3]
Central Europe	3.550	215	995	~9
South of France	5.000	300	1390	~6.3
Florida	5.850	355	1640	~5.3
Arizona	8.000	485	2245	~3.9

[1] Average annual radiant exposure outdoors (mean value over 10 years)

[2] Xenon instrument - 60 W/m² (295-400 nm)

[3] 1 year ~ 8.760 hours

J = W x s

Textiles; AATCC, ISO 105, …
Plastics; ISO 4892, ASTM, …
Automotive; SAE, VW, BMW, Peugeot/Citroen, Renault, …

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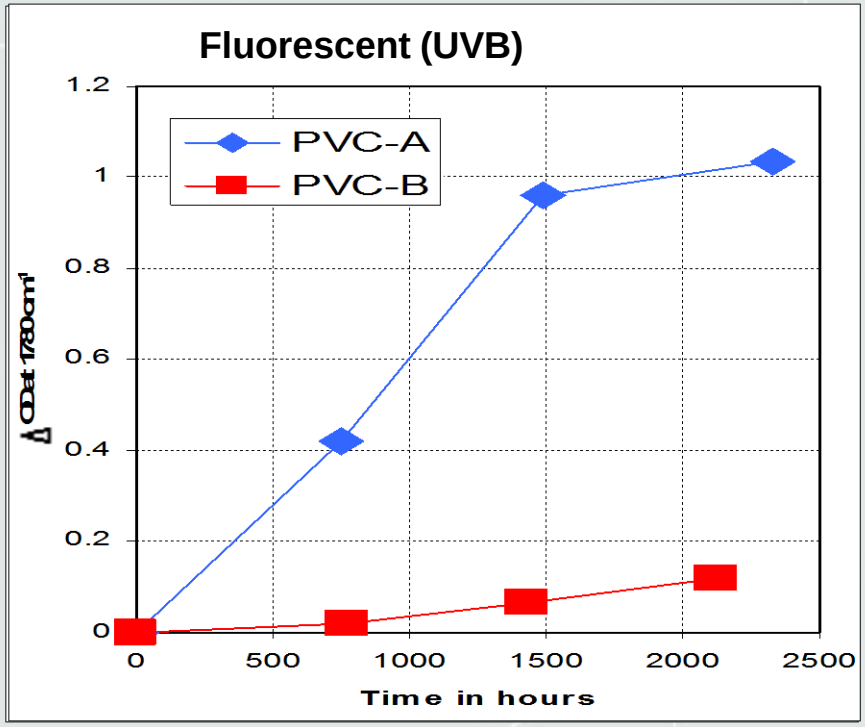
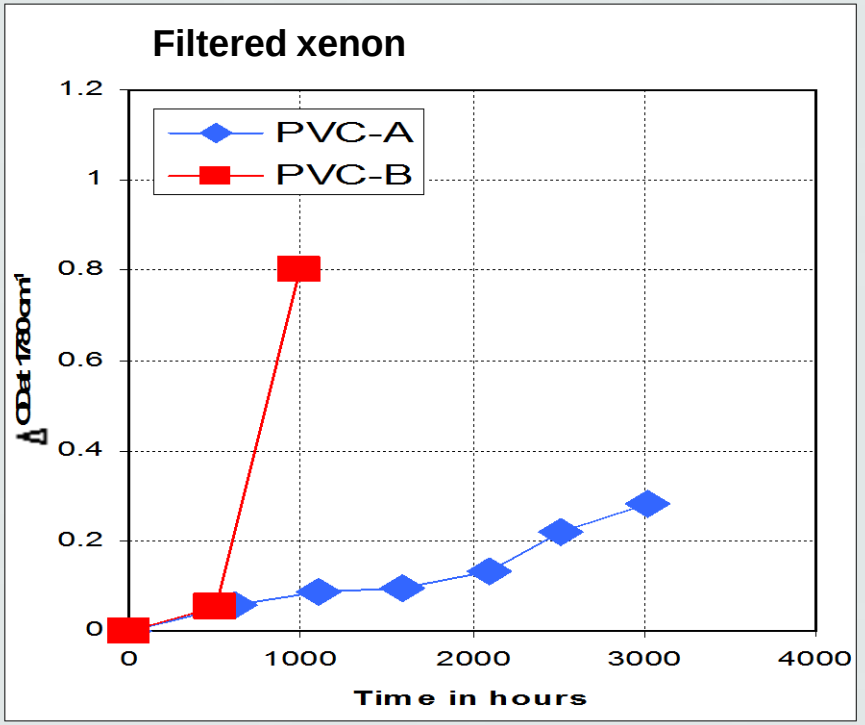
CORRELATION AND ACCELERATION

PVC as example





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Questions?

Thank you for your attention!

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