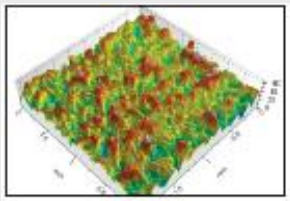
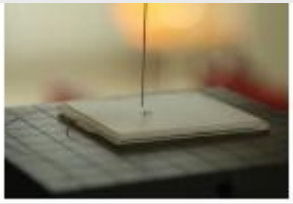
HelioScreen

Fact: Substrate choice

- Difference between PMMA substrates





Different manufacture process lead to:
- Different topography parameters
- Different affinity with products
...
- Different In Vitro SPF values

- Proposal to have a multi-substrates approach
- Any kind of molded or sandblasted PMMA plates? NO!

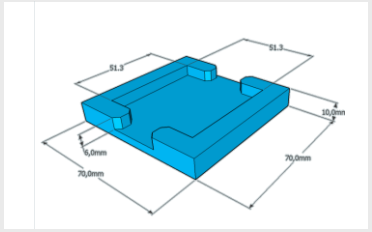
But at the end, which one (molded or sandblasted) is the best for correlation?!
THE BOTH

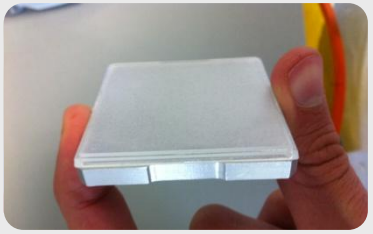
Fact: Control of the temperature at the interface product/substrate

Control during*:

- Pre-condition
- Application
- Spreading
- Drying
- UV exposure

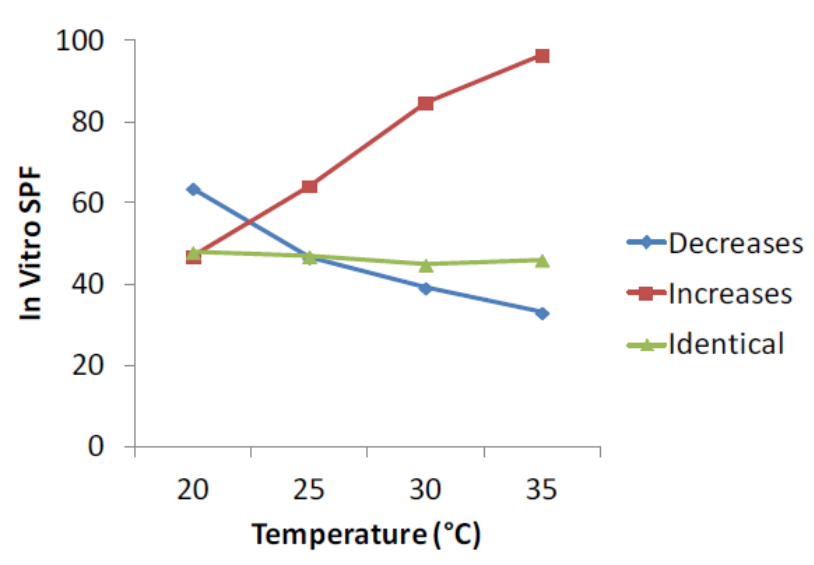
<1 °C variation with appliance





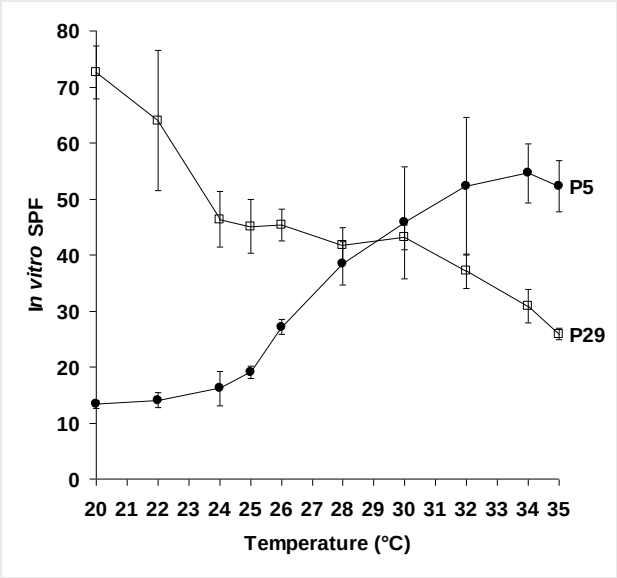
Low °C variation with metallic supports if taken off appliance

Fact: Control of the temperature at the interface product/substrate



>80%

products have a SPF significantly different only with 5°C variation



2°C

variation can led to SPF significantly different

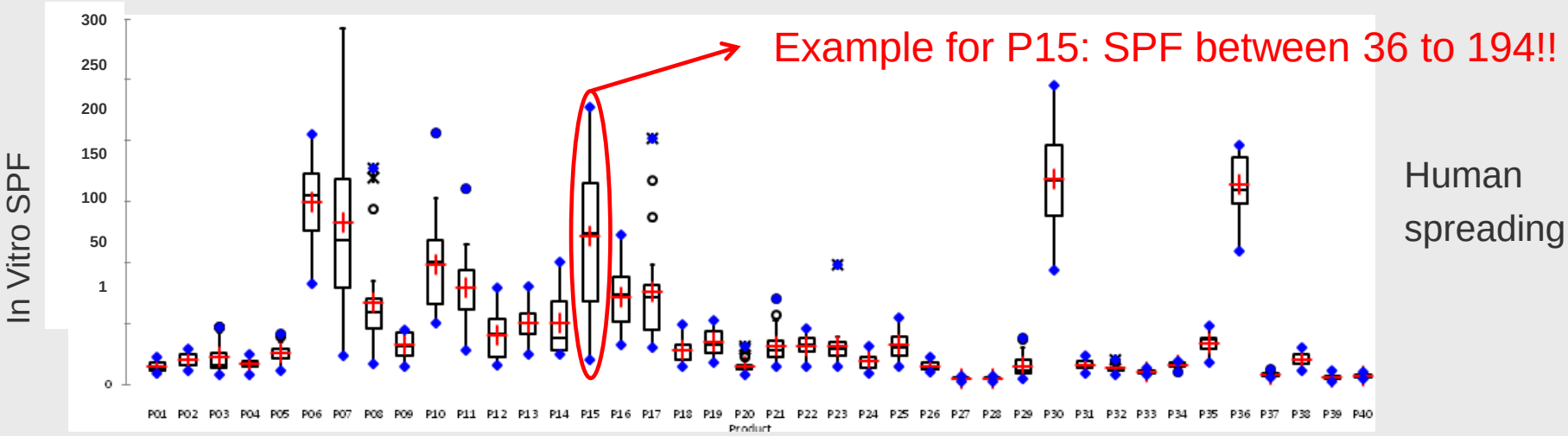
Robot project

Study conditions for human spreading

36 Sunscreen products tested

8 Operators for human spreading

1 Place with control of: Substrate – Temperature – Pressure – Gesture - UV analyzer - Calculation

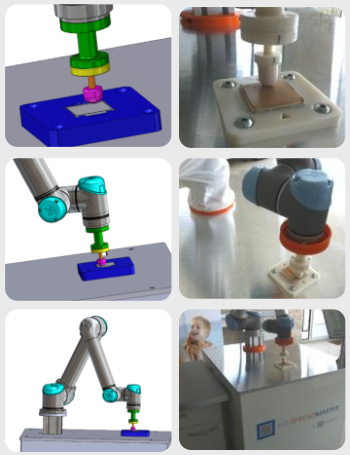


Robot project

Study conditions for human spreading

- Same sunscreen products
- Same place
- Same time

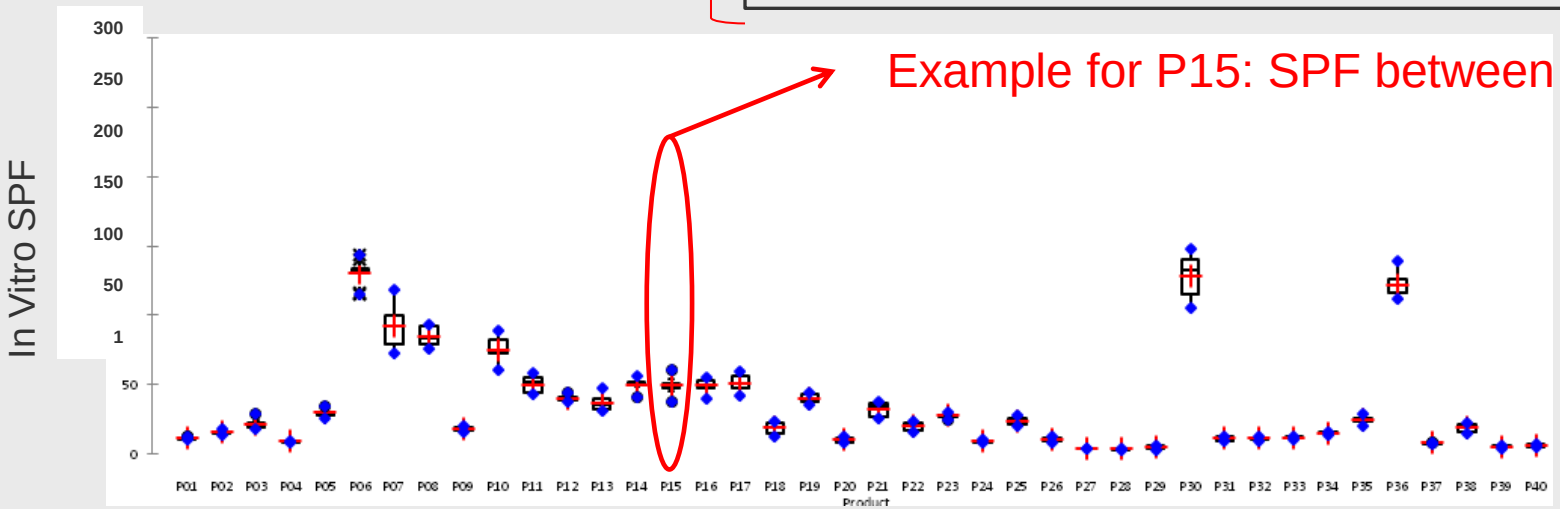
But with robot spreading instead of human



20 Shore - Mimic human finger

1 Min – Same time and movement than human spreading

3 Reproducibility sessions for robot spreading



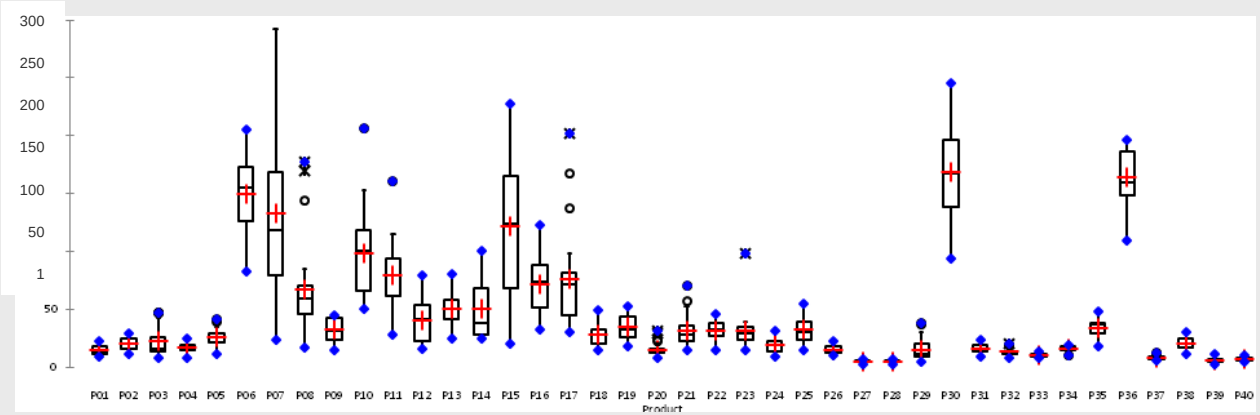
Example for P15: SPF between 44 to 54!!

Robot spreading
(HD-SPREADMASTER)

Fact: Automated spreading reproducibility

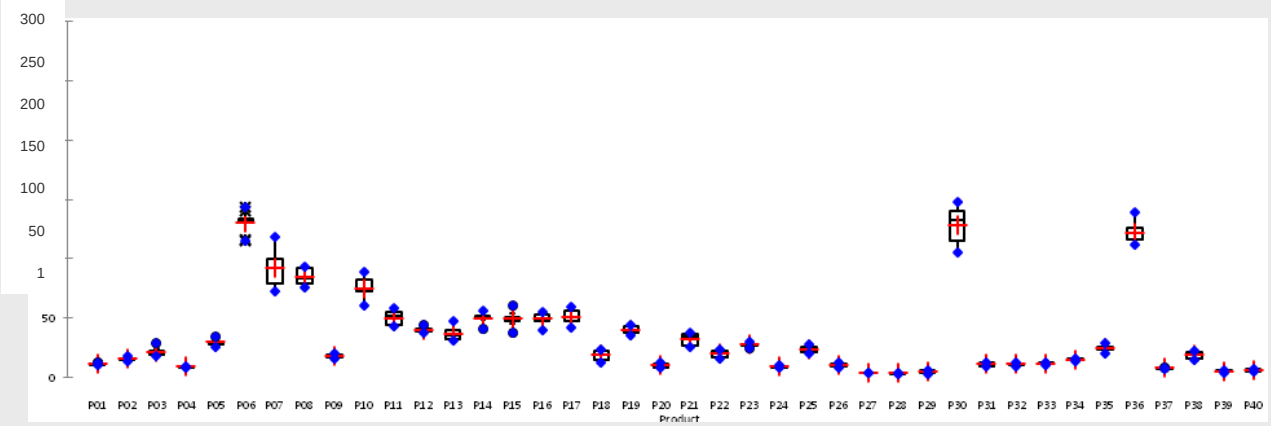
- Recent knowledge about spreading ensures In Vitro reproduciblity

In Vitro SPF



Human spreading

In Vitro SPF

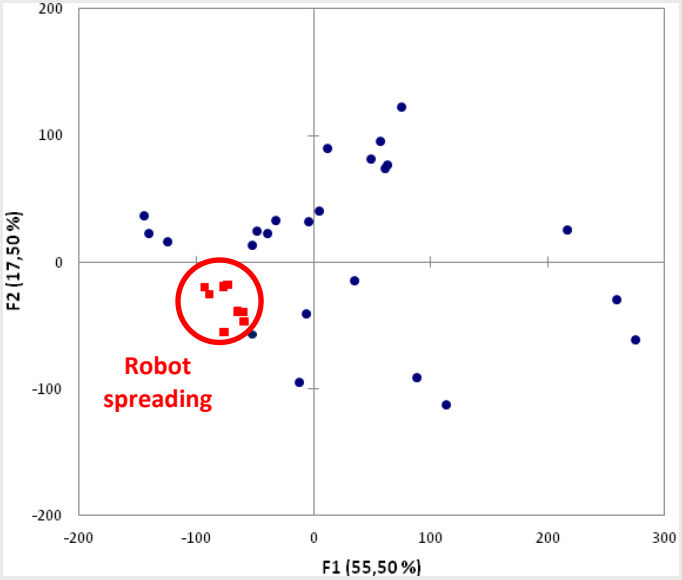


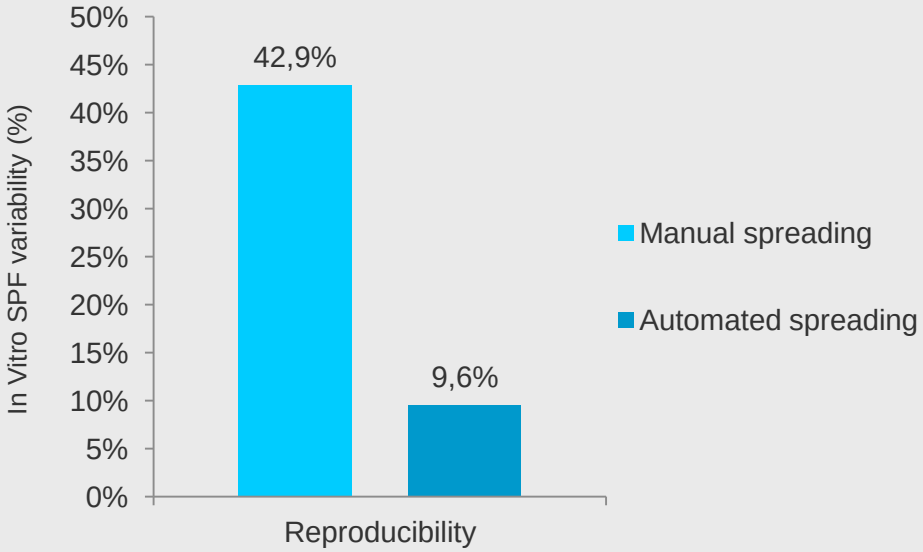
Robot spreading
(HD-SPREADMASTER)

HelioScreen

Robot project
Results

- Principal Component Analysis and R&R analysis

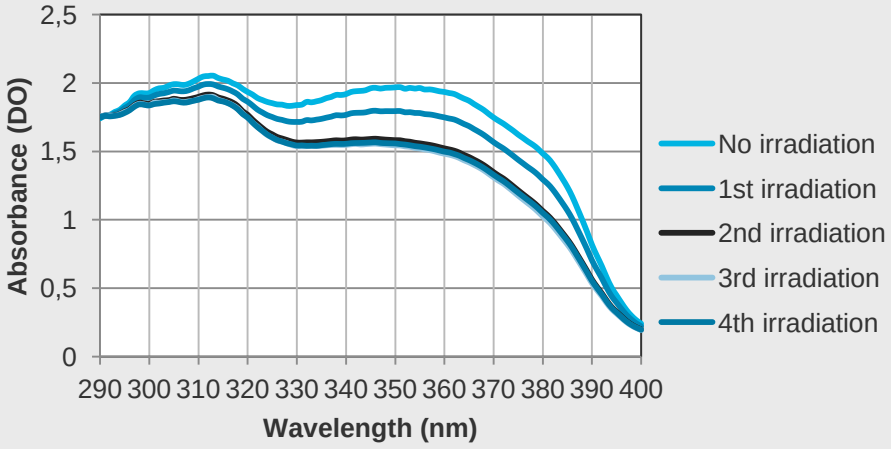


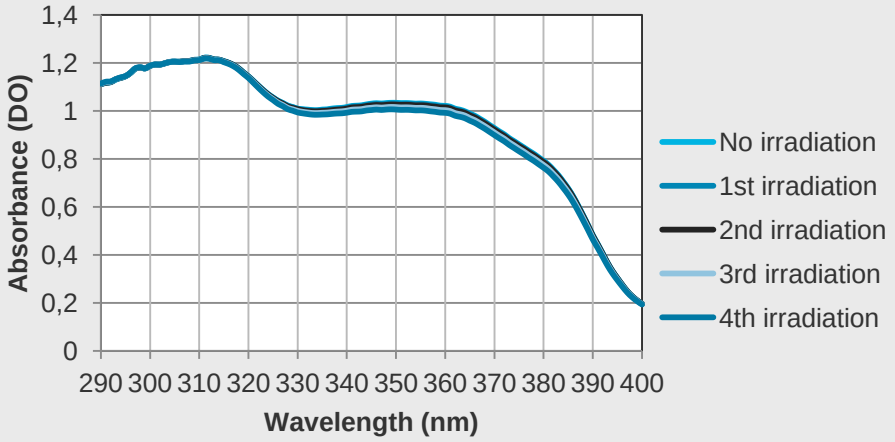


- Conclusion
  - High improvement of reproducibility by means of robot spreading compared to human spreading

Fact: Photo-degradation

- Photo-stability of product could be challenged according to the combination « Product » / « UV irradiation dose »

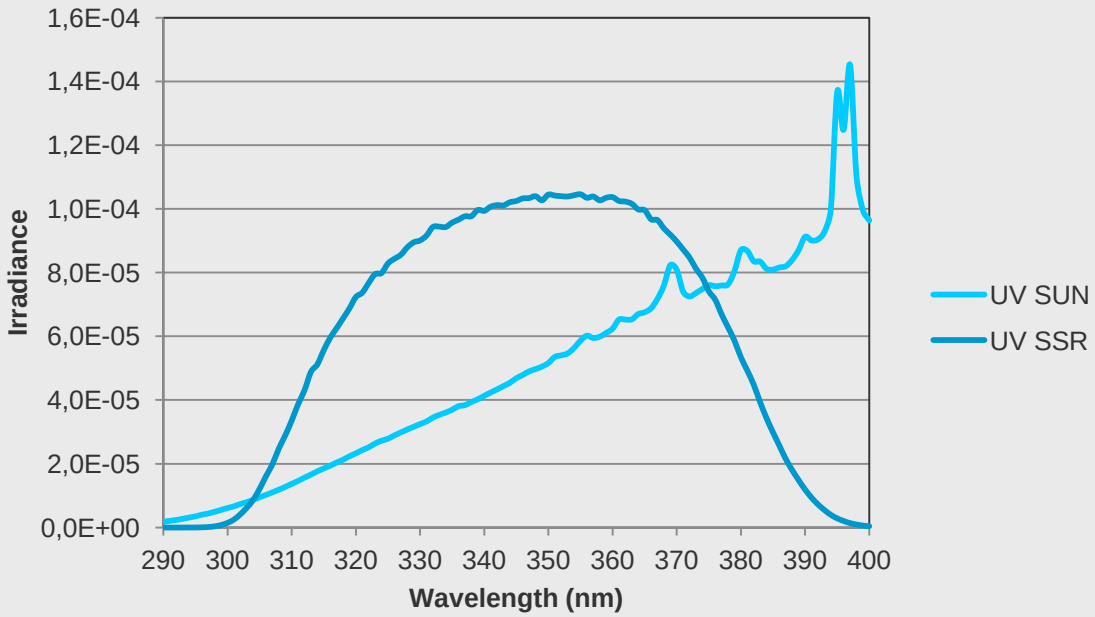




- Proposal to have an UV irradiation dose linked to the the product by means of a single UV irradiation step according to initial In Vitro SPF_i:
  - $D\ (MED) = In\ Vitro\ SPF_i \times D_{coeff}$
- Any kind of solar simulator? NO!

Solar Simulator

- UV source difference:
  - Similar to the sunligh (UV SUN)
  - Similar to the UV source used during In Vivo test (UV SSR)



UV curve expressed by:
- UVA/UVB ratio
- Irradiance level
- % RCEE
- % UVA and UVB part
- …

UV source expressed in:
- MED
- SED
- J/cm²
-…

- Only UV curve characteristics important for reproducibility? No!

Solar Simulator

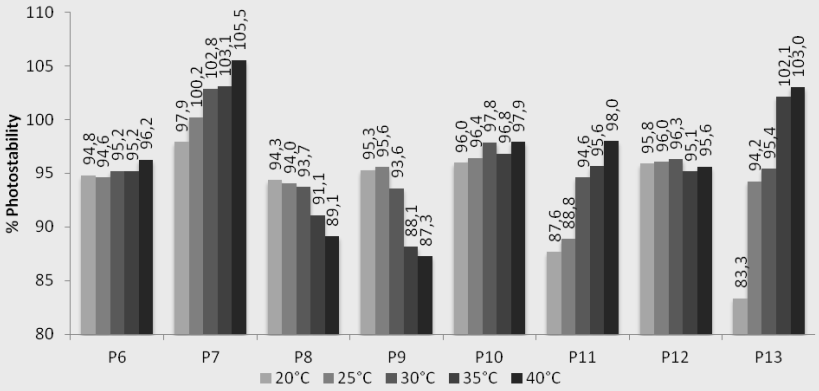
- UV irradiation condition:
  - Cooling air flow
    (Example for 1 product)

UV measured →

Irradiation without air flow				Irradiation with air flow			
Left	Middle	Right	Overall	Left	Middle	Right	Overall
			Mean ± SD				Mean ± SD
19	14	21	18 ± 5	53	9	4	21 ± 24

In Vitro SPF →

  - Heating temperature
    (%photostability equal to ratio between SPF after and before UV irradiation)



- Conclusion:
  - No strict control of UV irradiation step => Variability of In Vitro SPF