

HELIOPLATES HD A NEW SUBSTRATE FOR ABSORPTION MEASUREMENT

Keywords: Pmma substrate . In Vitro SPF UVA determination Transmission measurement

Historic and origin of the project...

HelioScreen labs Laboratories, proposed in 2000 as a new substrate (HELIOPLATES). This substrate was specifically designed for determination of SPF (1) or any other solar protection factors .protection following the method proposed by Diffey and Robson (2) . Unless it was a real contribution for the in vitro testing process, there were still some problem of reproducibility and question about roughness and quality of the plates (3)

The fact was than the process based on sandblasting was not accurate to guarantee reproducibility for each plate The manufacture principle of the « former pates » is to start from a large PMMA plate containing no UV filters . It is sandblasted according to an industrial method and then cut into 5cmx5cm plates which are right away used for in vitro measurement .

HelioScreen Labs has now developed, with the help of 2 partners (a) (b), a new manufacturing process to offer a specifically adapted substrate, with very precise specification: **Manufacturing process by injection to guarantee reproducibility**

It has been a hard job to define all the parameters allowing correct spreading of the products on the substrate and to deposit the adequate quantity. Further more, several parameters have to be defined to be able to characterize the good topography of the mold from which will be produce the plate. With the help of the Coty Lancaster Cie (b) all the important parameters have been defined. Further on, it has been proposed a control card to insure the quality of the plate.

A better reproducibility

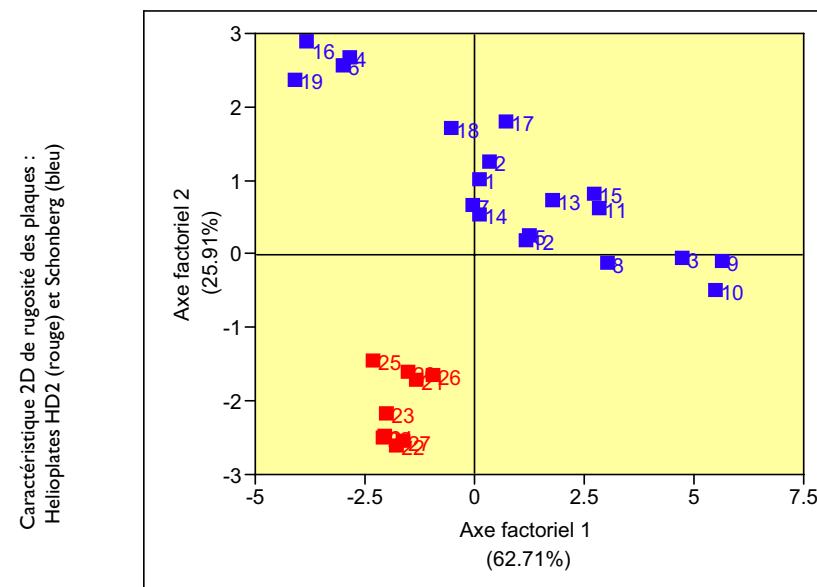
Several measurement of roughness and other parameters from our control card have been performed on two different plates. The new Helioplates HD2 and the Schönberg PMMA plates which have been used in the ring test of the UVA Colipa (4). Then we realized on both plates the evaluation of the UVA_{pf} on several products following the COLIPA protocol (3)

We have had to sort the Schönberg plates to avoid too much variability. Due to the molding process , we did not have to do the same with the Helioplates HD.

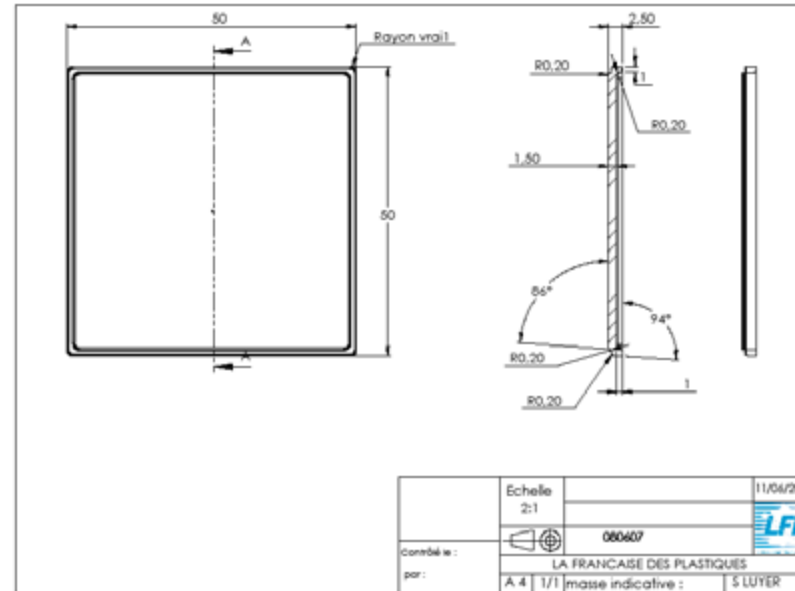
The results about roughness shown in fig 1 clearly show a best reproducibility for Helioplates HD2. The dispersion for Schönberg plates is around four times higher than Helioplates HD2 (Fisher test) For both plates we have a good correlation with the in vivo p_{pd} value. Nevertheless there is still a better variability for Helioplates HD as lo,g the standard deviation is lower and unless the prior selection for Schönberg plates following COLIPA requirements (4) has been done.

Plates HD 2µm : in vitro PPD = 0.147 + 0.854 in vivo PPD (residual standard deviation = 1.006)

Plates Schönberg : in vitro PPD = 0.171 + 0.833 in vivo PPD (residual standard deviation = 1.411).



Conception and industrial process...



The industrial process included a prior phase of developing the mold. LFP Cie (c) was the partner of HelioScreen labs for this development. Further on they have the hard task to produce the plates following a strict process and quality control at each step of the production

How to choose the roughness...

It had been defined previously a roughness around 5/7 microns to access to the most common Index values such as SPF or UVA pf. Ferrero and Co (3) put into the light the importance of the roughness and a less variability for the 6 microns plates. Further on the COLIPA proposed a method for the In Vitro determination of the UVA (4). For this reason, two roughness are proposed for HELIOPLATES HD..

- HELIOPLATE HD 2** (50mmX50mm) about 2 microns roughness. This grade is mainly for carrying out the **UVA COLIPA's method** (2007 version) .
- HELIOPLATE HD 6** (50mmX50mm) about 6 microns roughness. This grade is advisable for any other use and particularly for SPF and photo stability measurement.
- HELIOPLATE HD 00** (50mmX50mm) with UV filters, delivered with reference spectrum, allows checking the equipment before measurements.

Quantity applied will depend on the roughness. It is advisable to apply:
around 0.75 mg/cm² for HELIOPLATE HD2
around 1.2 / 1.3 mg/cm² for HELIOPLATES HD6

Application and Spreading...

Product is applied to the substrate by weight. Application rate is determined in such a way that the actual quantity of product left on the substrate before equilibration is 0.75 mg/cm². for HELIOPLATE HD2 and 1.3 mg/cm². for HELIOPLATE HD6.

To ensure the correct application rate ,the pipette has to be weighed before and after product application.

The amount of sunscreen product in the form of a large number of small drops of equal volume is applied by pipette and distributed evenly over the whole roughened PMMA surface of the plate (50 x 50 mm).

Immediately after weighing, the sunscreen product is spread over the whole surface with a finger-cot » pre-saturated « with the product using light strokes. Spreading had to be completed as quickly as possible (less than 30 seconds). Then the sample was rubbed into the rough surface using stronger pressure. This also had to take 20 to 30 seconds. The sample thus obtained was allowed to settle for 15 minutes in the dark at room temperature to ensure self-leveling of the formula.

-1) A first measurement must be performed on a plate covered with glycerin but without product to make the blank. It is now not worthwhile to sort the plate as with former PMMA plates. Any plate can be used without any prior control.

2) The sun care product is applied in a large number of small drops evenly distributed over the whole surface of the plate.

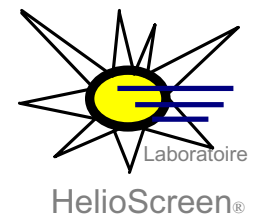
3) Spreading
a) Start the chronometer
b) After application, the sun care product is immediately spread over the whole substrate surface using a bare finger, in 20 seconds and following this procedure :

$t = 20\text{ s}$



Fabrication of HELIOPLATES HD

- 1-Injection in a mold
- 2-Out of the mold
- 3-Separating of each plate
- 4-Quality control



(1)Cosmetic & toilettries 2003 118,63-71 Determination of the in vitro SPF. Pissavini Ferrero Allard Lutz et col...
(2) Diffey, B.L., Robson, J., A new substrate to measure sunscreen protection factors throughout the ultraviolet spectrum, J.Soc. Cosmet. Chem., 40 (1989) 127-133.
(3) Importance of Substrate Roughness for In Vitro Sun Protection Assessment L Ferrero et col IFSCC Vol9 n°2 avril/juin 2006
(4) COLIPA Method for the in vitro determination of UVA protection provided by sunscreen products Edition of 2007