# FLUORILON-99W

Stable white thermoplastic with extremely high diffuse reflectance, available as reflectance standards or bulk material

**Categories:** HIGH REFLECTANCE DIFFUSE OPTICAL COATINGS & MATERIALS, MATERIALS & COATINGS, PHYSICAL STANDARDS, REFLECTANCE STANDARDS

- Product Information

Fluorilon-99W™ is a sintered PTFE material with the highest diffuse reflectance of any known material. The material is both thermally (>300°C), physically, and chemically stable to all but the most hostile environments. It has been successfully used in a number of space applications as a calibration target.

The material is primarily used as a component in reflective optical systems where the highest diffuse reflectance possible is required.

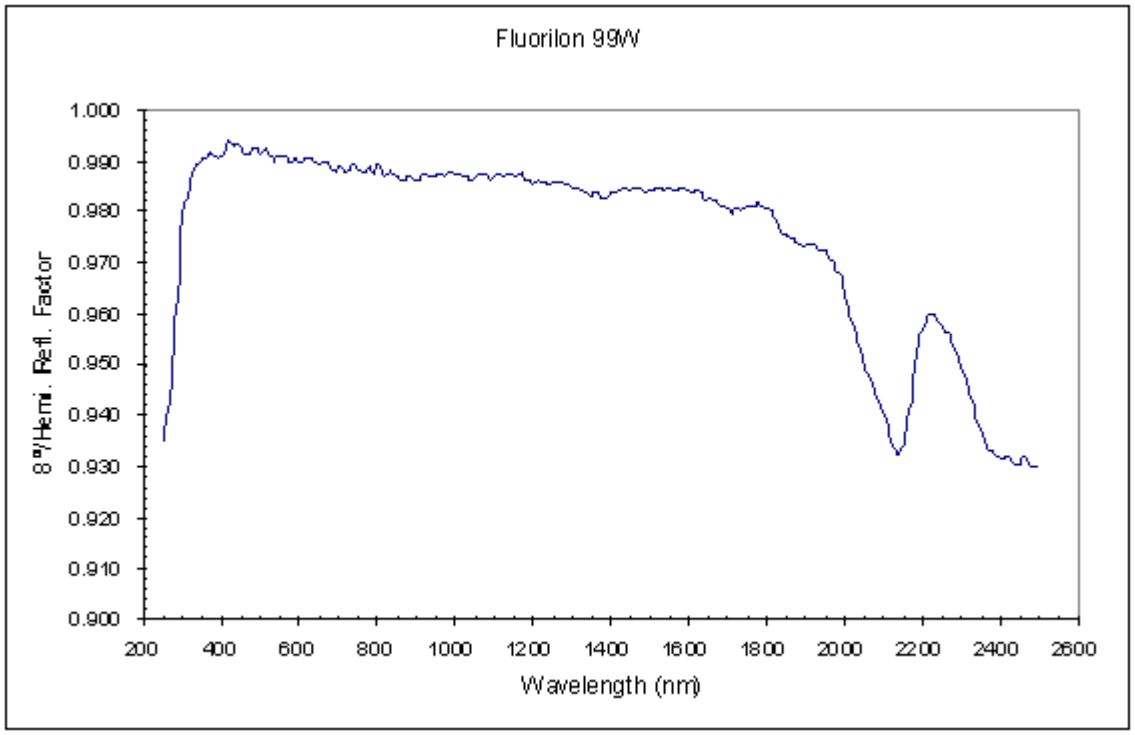
Fluorilon-99W™ is available as a reflectance standard, or as bulk blocks or cylinders.

## Properties

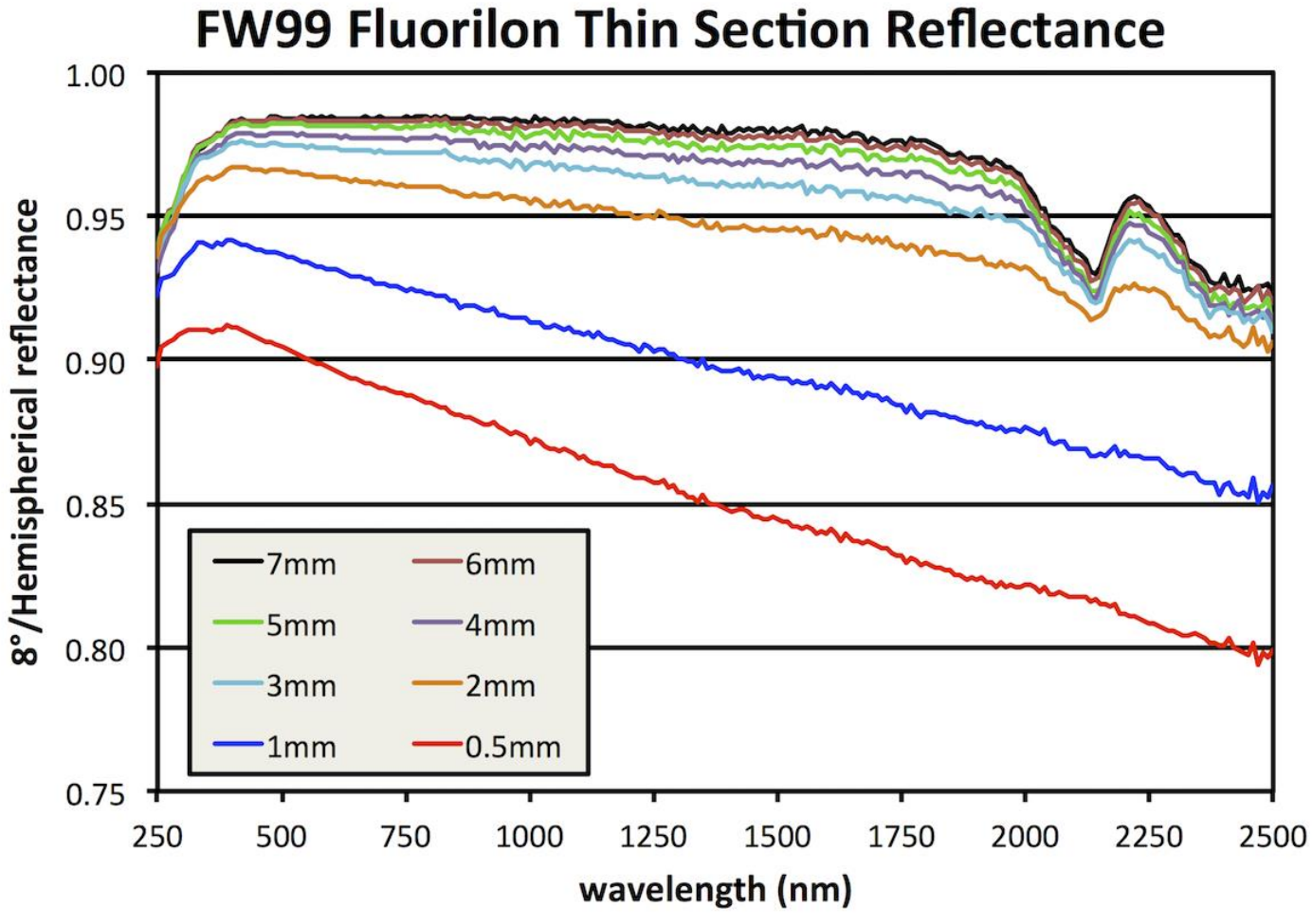
- Greater than 99% reflectance in the 400-800 nm range
- Reflectance of >97% over the 300-2200 nm range
- Reflectance of >92% over the 200-2500 nm range
- Hydrophobic
- Chemically inert
- Thermally stable to 300°C
- Durable and cleanable

## Typical 8°/Hemispherical Reflectance Data

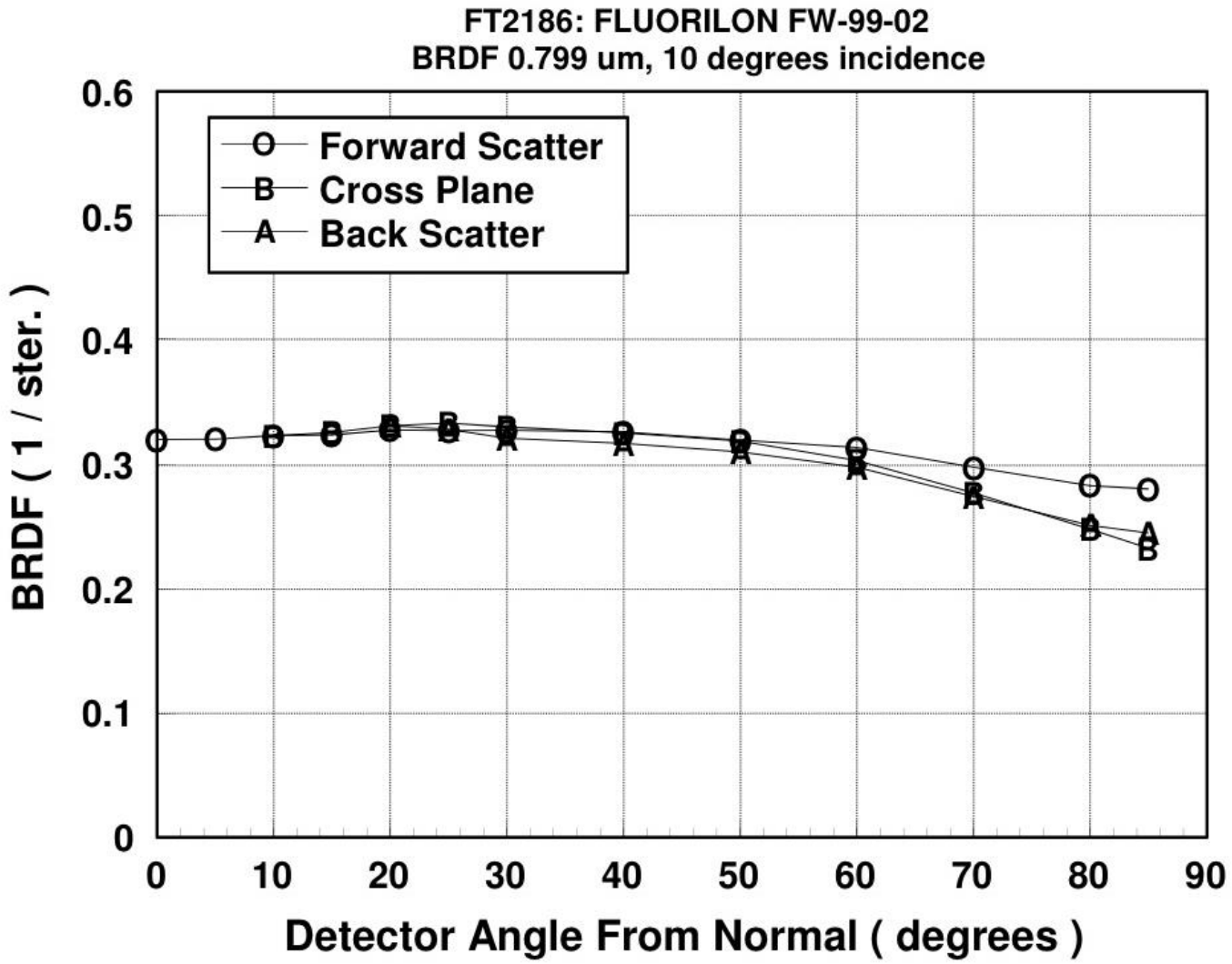
| Wavelength | Reflectance |
|---|---|
| 2500 | 0.930 |
| 2400 | 0.932 |
| 2300 | 0.949 |
| 2200 | 0.960 |
| 2100 | 0.940 |
| 2000 | 0.964 |
| 1900 | 0.973 |
| 1800 | 0.981 |
| 1700 | 0.981 |
| 1600 | 0.985 |
| 1500 | 0.984 |
| 1400 | 0.984 |
| 1300 | 0.986 |
| 1200 | 0.986 |
| 1100 | 0.987 |
| 1000 | 0.987 |
| 900 | 0.987 |
| 800 | 0.989 |
| 700 | 0.990 |
| 600 | 0.990 |
| 500 | 0.992 |
| 400 | 0.991 |
| 300 | 0.980 |
| 250 | 0.935 |




**Representative hemispherical reflectance**




**Thin section hemispherical reflectance (click for full size)***




**FWS-99-02 Standard: Bidirectional Reflectance Distribution Function (BRDF) VS. Detector Angle (th_r)**

**Wavelength=0.799 µm, incident angle 10° (click for full size)***

- Ordering

| | |
|---|---|
| **Fluorilon-99W** | *Bulk Fluorilon™ is available in sizes up to 12" square and up to 2" thick. Contact us for more information.* |
| **FWS-99-01** | *1.25" diameter White Fluorilon Reflectance Standard Specify calibrated or uncalibrated* |
| **FWS-99-02** | *2.00" diameter White Fluorilon Reflectance Standard Specify calibrated or uncalibrated* |
| **EFWS-99-01** | *1.25" diameter White Fluorilon Reflectance Standard, Encapsulated Specify calibrated or uncalibrated* |
| **EFWS-99-02** | *2.00" diameter White Fluorilon Reflectance Standard, Encapsulated Specify calibrated or uncalibrated* |

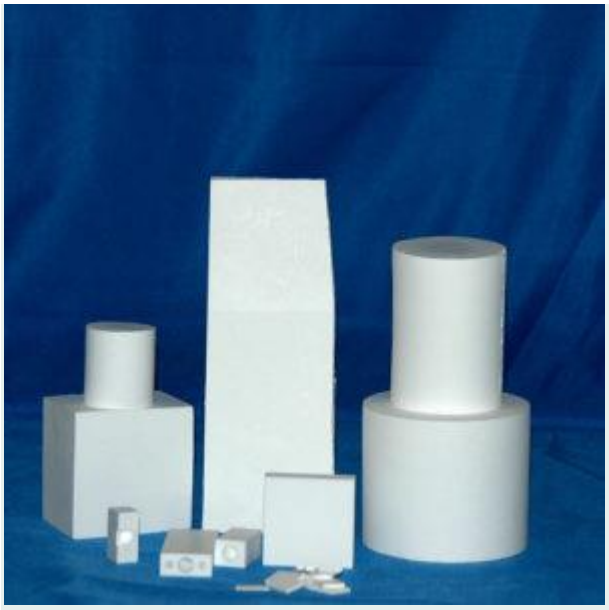
| | |
|---|---|
| **FWT-99-02** | *2.00" square White Fluorilon Reflectance Standard Target*<br>*Specify calibrated or uncalibrated* |
| **FWT-99-04** | *4.0" square White Fluorilon Reflectance Standard Target*<br>*In Delrin Holder with 1/4-20 mount*<br>*Specify calibrated or uncalibrated* |
| **FWT-99-05** | *5.0" square White Fluorilon Reflectance Standard Target*<br>*In Delrin Holder with 1/4-20 mount*<br>*Specify calibrated or uncalibrated* |
| **FWT-99-06** | *6.0" square White Fluorilon Reflectance Standard Target*<br>*Specify calibrated or uncalibrated* |
| **FWT-99-10** | *10.0" square White Fluorilon Reflectance Standard Target*<br>*Specify calibrated or uncalibrated* |
| **FWT-99-XX** | *Custom Size White Fluorilon Reflectance Standard Target*<br>*Available calibrated or uncalibrated*<br>*Contact us for more information* |
| **Custom** | *Custom products are our specialty!*<br>*Contact us for more information.* |

## Fluorilon Reflectance Standards

Fluorilon standards are available as 1.25″ (32 mm) or 2″ (50.8 mm) diameter disks, with a Delrin™ holder and protective cover. Larger targets (up to 10″ square in single piece, up to 48″ square/ 1200 mm as arrays) are also available, as are custom sizes.

Fluorilon is also easily machined into almost any shape; see the bulk fluorilon section or contact us for more information.

## Bulk Fluorilon



Fluorilon-99W is available in bulk in sizes up to 10″ square and up to 2″ thick. Contact us to discuss your specific application.

Fluorilon can be machined into almost any shape. Our machinists have extensive experience with the nuances of machining Fluorilon; however, we also provide a guide for machining Fluorilon if you choose to engage your own machining facility.

## Applications include:

- Flat panel backlights
- Illuminator panels
- Integrating spheres
- Line and cylindrical scanners and illuminators
- Reflective diffuser panels
- Reflectance standards for laboratory and remote sensing applications
- Lamp housings (xenon flash, tungsten, LEDs)
- Collection spheres for fiber optic evaluation
- Attenuators for fiber optics couplers

## Physical Properties:

- Density: 1.5-1.6g/cm$^3$
- Porosity: 40-50 %
- Pore size: typically 25-35 microns
- Decomposition point: about 400°C
- Toxicity: GRAS (non-toxic, same toxicity as Teflon)

# Fluorilon-99W FAQ

## How stable is Fluorilon-99™ to aging?

Under normal conditions, Fluorilon-99W™, as with any sintered PTFE product, will have indefinite stability. The only causes of instability are contaminants introduced into the material from the environment in which it is used. Advanced aging studies on sintered PTFE such as Fluorilon™ have indicated stability in excess of 100 years.

## How stable is it with UV energy/time?

If the material is kept clean, UV stability is greatly enhanced. Extensive research has shown that UV radiation above 350 nm has little, if any, effect on Fluorilon™ and other sintered PTFE materials if they are kept clean. Fluorilon™ itself is not affected by UV; the contaminants are.

## What kind of effects happen with temperature/reflectance?

Sintered PTFE such as Fluorilon™ has been used extensively as a standard for spectrophotometers and spectroradiometers in low-earth orbit space platforms. Under such conditions, it experiences temperatures from about 4K to about 450K. While the expansion and contraction of the material may cause minor changes in reflectance, there are no literature citations (and the literature is extensive) that indicates that there IS a change.

## What kind of cleaning is recommended for Fluorilon™?

The best way to clean Fluorilon-99 is to sand the optical surface with 220 grit waterproof silicon carbide paper (we suggest 3M brand) on a flat surface, using a stream of running water to clean the abrasive. For volatile contaminants, a vacuum bake at 10^-6 torr at 90°C for 24-48 hours is recommended.

## What kind of known changes happen to the standard in a box in a stock?

None that we've seen. It depends where the box is, however- if there are chemical fumes around, these may be absorbed by the Fluorilon™ and affect its performance in the UV (under 300 nm) and in the NIR (above 1500 nm).

## What are the effects of humidity?

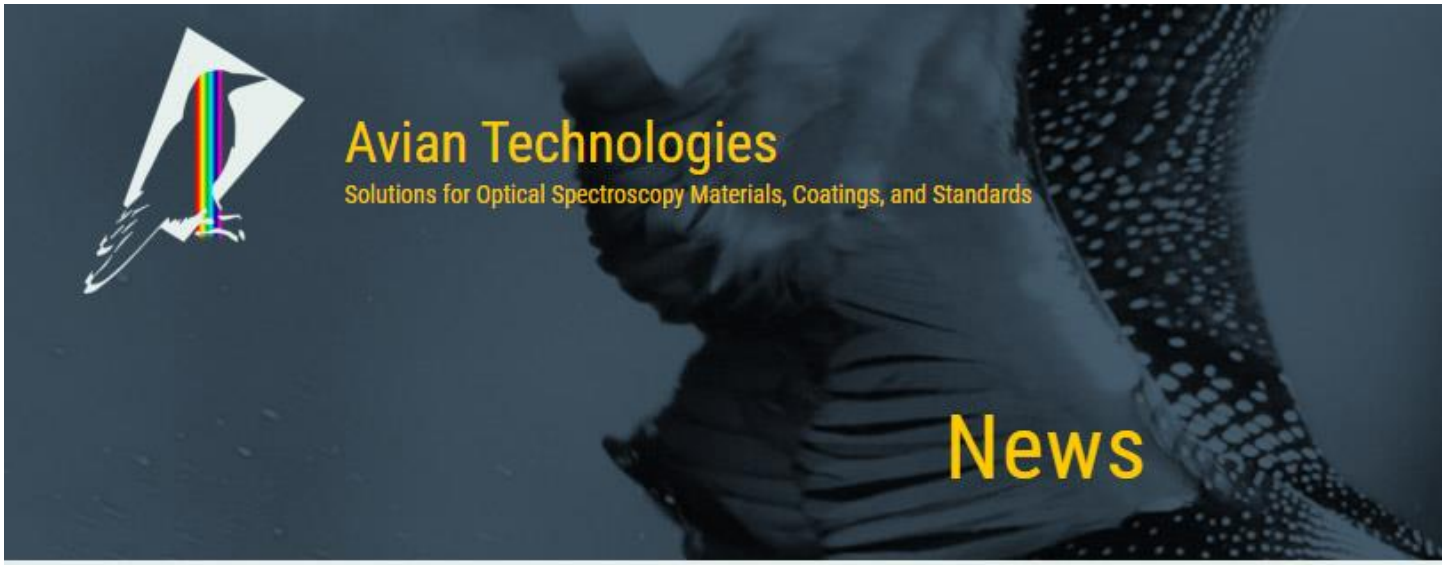
Humidity has no effect unless you are working in the NIR where water bands may be observed. This comes from surface adsorption that will occur with any
material. Fluorilon-99W is, itself, very hydrophobic.

## How fast does Fluorilon-99 become yellow?

Under typical laboratory and field conditions, Fluorilon™ will not yellow. Only the contaminants that it absorbs will yellow. PTFE- the starting material- is a remarkably stable material but any porous substance such as Fluorilon™ or other low density sintered PTFE materials will absorb organics from the environment. These materials will degrade, causing the yellow coloration, but this will only occur under very harsh conditions. Remember, this is an optical material and should be treated as you would any other reflecting or transmitting optical component.

## Can Fluorilon-99 be sprayed onto a substrate?

Fluorilon-99 is a monolithic thermoplastic. It is not a coating and thus cannot be applied like one. However, thin sheets of Fluorilon-99 can be prepared and adhered to substrates with certain adhesives. While this procedures is not recommended, in certain cases it can be successfully employed.

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