

# Amount of solar radiation measured with film

## Solar radiation film

# OptoLeaf®

OptoLeaf is a film to measure the integrated amount of solar radiation and the integrated amount of light quanta. The color matter fading degree of the film caused by solar radiation is obtained, and the color fade rate is converted to the integrated amount of solar radiation and the integrated amount of light quanta with use of the calibration curve.

This film enables measurements at places where a conventional pyranometer cannot measure or also enables simultaneous multipoint measurements.



### Main Features

- Small and light because it is a film
- **Placeable anywhere** (measurable even in the water)
- **Convenient for multipoint measurements at the same time** for it can be prepared in large numbers
- Amount of light quanta as well as amount of solar radiation is measurable
- Required size of film is obtained by cutting, so **it is low cost per piece**



### Example of use

- Measurement of solar radiation amount at plantations of vegetable and fruit or forests
- Measurement of solar radiation at plant leaf surfaces
- Measurement of solar radiation in greenhouse or the like (a calibration curve in greenhouse required)
- Measurement of solar radiation at the surface or shadow of buildings
- Measurement of solar radiation on the surface of human bodies
- Measurement of water turbidity based on amount of solar radiation in water

### Simultaneous multipoint measurements.



OptoLeaf



(Roll of 35mm (width) x 10m)

Product No.	(color- length of measurement period)	Type	Measurement period as a guideline
R-3D	(Red - 3Days)	Standard type	3 to 7 days
Y-1W	(Yellow - 1Week)	Long-term measurement type	1 to 3 weeks
O-1D	(Orange - 1Day)	Short-term measurement type	1 to 3 days

[Cautions] To obtain the OptoLeaf color fade degree, an instrument to measure the absorbance of OptoLeaf is necessary.

# How to use OptoLeaf

## 1. Type selection and cut

Measurement period (chart shown below)/cut to length of 20 mm

## 2. Measurement of absorbance at the beginning (before exposure)

Use of D-Meter (spectrophotometer can be also used)

## 3. Placement at measurement point

Placement with exposure surface (inner side of roll) toward solar radiation side

## 4. Collection

Defective when exposure is insufficient or too much

## 5. Measurement of absorbance after exposure

Same as 2

## 6. Calculation of color fade rate

Calculation formula of color fade rate (chart shown below)

## 7. Conversion to integrated amount of solar radiation

OptoLeaf color fade curve (attached sheet)

### Measurement period (period required for color fading)

Product No. (color/period)	Summer/fair weather	Summer/cloudy weather Winter/fair weather	Winter/fair weather
R-3D (●Red-3Days)	1 to 2 days	2 to 5 days	4 to 8 days
Y-1W (●Yellow-1Week)	3 to 7 days	5 to 14 days	1 to 3 weeks
O-1D (●Orange-1Day)	0.5 to 1 days	1 to 2 days	2 to 4 days

\*The periods described above are guidelines. Adjustment is necessary depending on measurement conditions.

### Fade rate formula

Product No.	Max absorbance wavelength	Fading rate formula	Fading rate (%)
R-3D	521nm	$\log_{10}(D/D_0 \times 100)$	
Y-1W	468nm	$D/D_0 \times 100$	
O-1D	492nm	$D/D_0 \times 100$	Range 30-90%

$D_0$  = absorbance at the beginning (before exposure)     $D$  = absorbance after exposure

- Cautions**
- OptoLeaf has front and back surfaces. The inner side of a roll is the exposure surface. Please use it by setting the exposure side to the solar radiation side.  
(If it is used with the reverse surface, correct measurements cannot be performed due to value errors.)
  - Finish the OptoLeaf exposure so that the absorbance is not less than 0.6.  
If the absorbance is less than 0.6, correct measurements cannot be performed.  
(A standard initial value at the time of manufacturing:  $2.0 \pm 0.2$ )

## OptoLeaf measuring instrument D-Meter RYO-470M

A portable absorbance measurement instrument dedicated to OptoLeaf. Absorbance (D) of OptoLeaf can be easily measured anytime, anywhere. The dedicated tool is designed for convenience and efficiency in measuring many OptoLeaf pieces. It is compact, light, and easy to carry.

The degree of exposure can be immediately checked on the site where OptoLeaf is pasted.



### RYO-470M

W76×H27×D135mm  
About 209 g (incl. batteries)  
Two AA batteries used

- **With memory function**  
990 data sets  
(1 to 99 data sets in each of 10 blocks)
- **Data output function available**  
Data can be transferred to a PC  
\*Need to use application software  
(with a function to convert to Excel format)



### RYO-470

W90×H35×D135mm  
About 250 g (incl. batteries)  
Two AA batteries used

- **No memory function**
- **No data output function**  
(Basic functions only)