AGC

Your Dreams, Our Challenge

LUMIFLON™

Solvent-soluble Fluoropolymer resin LUMIFLON

Introduction

LUMIFLON™ was developed and commercialized by AGC in the early '80s and was the first solvent-soluble fluoropolymer for coatings.
LUMIFLON™ can be cured at a wide range of temperatures, from ambient temperature to high temperatures.
Due to the high weatherability, LUMIFLON™ based coatings maintain their excellent appearance.
The use of LUMIFLON™ resins can substantially reduce life cycle costs, including maintenance costs, replacement costs, and re-coating, which leads to conservation of resources and a reduction in the consumption of VOCs.
Since LUMIFLON™ is a transparent fluororesin, it can be used for both clear and pigmented coatings.
LUMIFLON™ based coatings have been used for over 35 years all over the world in various applications, not only architectural and civil engineering projects but also in protective coating applications.

Since 1982

©ANA

Marina Bay Sands
(Product:ALPOLIC from Mitsubishi Chemical)

Osaka Castle

Components of industrial coatings

LUMIFLON™, a fluororesin, is one of the main components of paints and coatings.

Components for coating			Volitile components
Resin	**Pigment**	**Additives**	**Solvents**
●Synthetic resin ·**Fluororesin** ·Alkyd resin ·Acrylic silicone resin ·Epoxy resin ·Polyurethane resin ●Natural resin ●Cross-linker, Hardener	●Colorant ●Extender Pigment ●Metal Pigment ●Anticorrosive	●Dispersing agent ●Leveling agent ●Deformer	●Organic solvent ·Xylene ·Mineral turpentine ·Mineral spirits ●Water

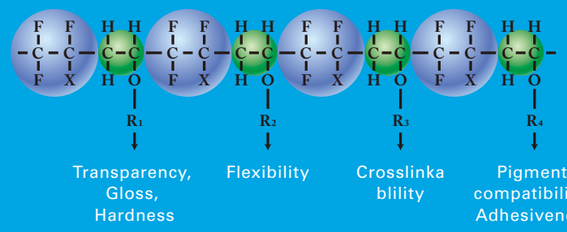
LUMIFLON™

Features

Excellent weatherability	LUMIFLON™ has good chemical stability typical of fluoropolymers and shows excellent weatherability compared to other conventional top coats.
Curable at room temperature	LUMIFLON™ offers a choice of curing conditions from ambient temperature to high temperatures.
Superior appearance	LUMIFLON™ is a transparent fluororesin suitable for use in both clear and pigmented coatings. LUMIFLON™ also can give gloss levels of 5 — 90% at a 60° angle.
Product forms available	Solvent grades, Waterborne grades, Flake grade (for the powder coating industry), Solid grades (soluble in various organic solvents)

MOLECULAR STRUCTURE

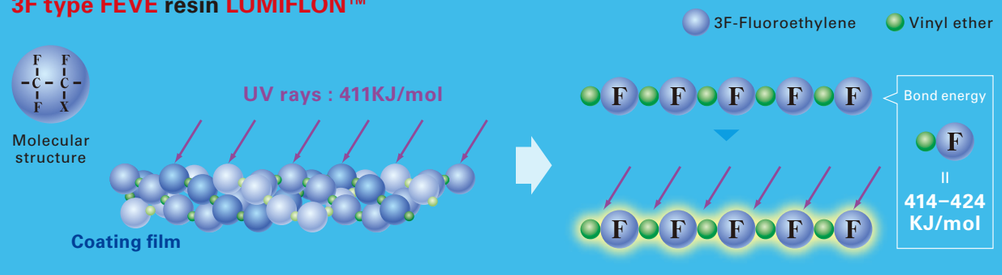
Polymer structure of LUMIFLON™



alternative sequence of fluoroethylene and vinyl ether units

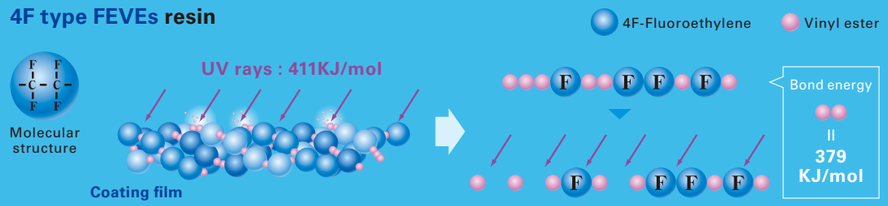
Image graphic of Fluoropolymer for coating

3F type FEVE resin LUMIFLON™



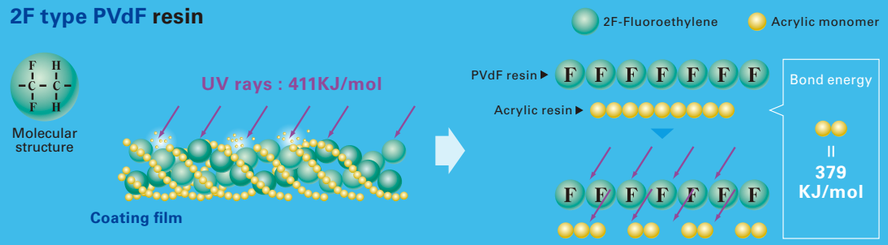
3F type FEVE resin LUMIFLON™ is a fluoroethylene (FE)/vinyl either (VE) copolymer (FEVE) comprising of an alternating sequence of fluoroethylene and several specific vinyl ether units. It is completely amorphous. The chemically stable fluoroethylene unit protects the neighboring vinyl ether unit from attack by UV and corrosive elements. The fluoroethylene units act like a protective shield to the vinyl ether units.

4F type FEVEs resin



4F type FEVEs resins comprise less regular alternating sequences than the LUMIFLON™ 3F type FEVE. These inferior 4F type FEVEs have many hydrocarbon (vinyl ester)-hydrocarbon (vinyl ester) sequences. These weak bonds are susceptible to being broken by UV.

2F type PVdF resin



The 2F type PVdF resin itself has high stability against UV ray attack. However, it is necessary to add acrylic resin in order to formulate PVdF into coatings. Acrylic resin is easily attacked and decomposed by UV rays. The amount of acrylic resin in the formulation negatively affects the coating's weatherability.

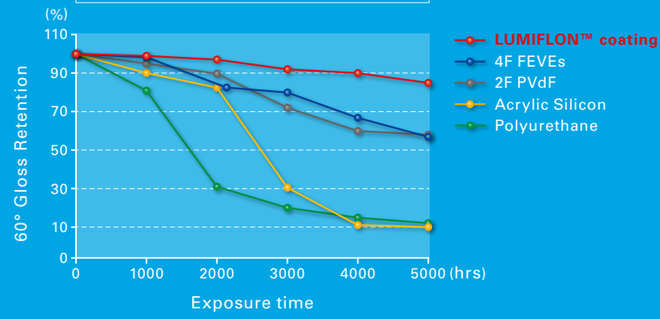
WEATHER RESISTANCE

Type of Resin	Weatherability	Color range	60° Gloss range (%)	Dry-Cure temp. (°C)	Recoat ability	Processability
3F type FEVE LUMIFLON™	Excellent	Wide	5 — 90	5 — 230	Excellent	Excellent
4F type FEVEs	Good	Wide	5 — 90	5 — 230	Good	Good
2F type PVdF	Good	Limited	20 — 35	250<	Poor	Poor

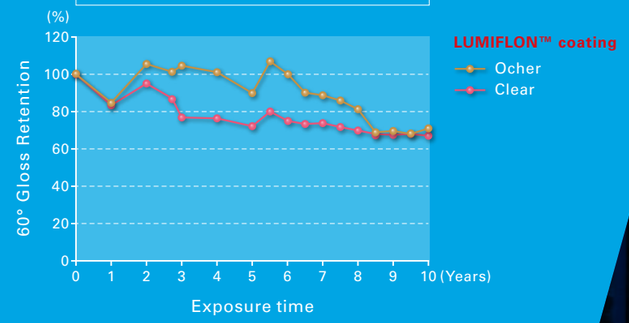
Weatherability data

LUMIFLON™ shows excellent weatherability compared to not only acrylic and polyurethane but also other fluororesins.

Sunshine weather meter test



Natural exposure test (Florida)

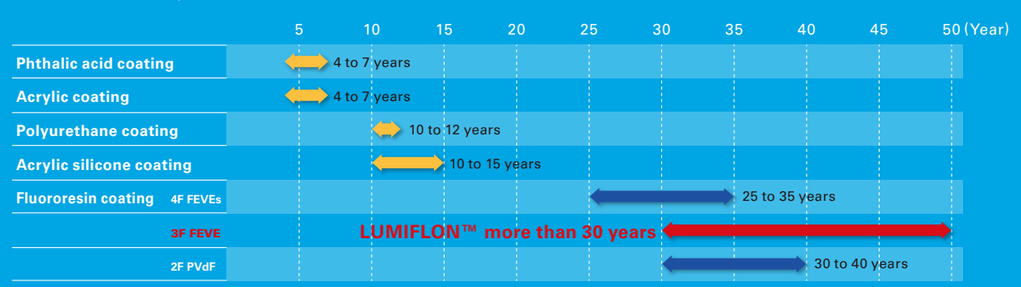


Ferrari World Abu Dhabi
(Coating:Beckers and Akzo Nobel)

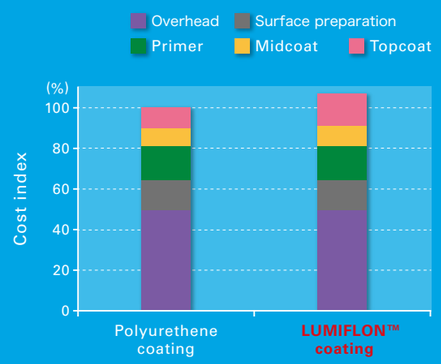
ECONOMIC EFFICIENCY AND SUSTAINABILITY

Life expectancy of coating

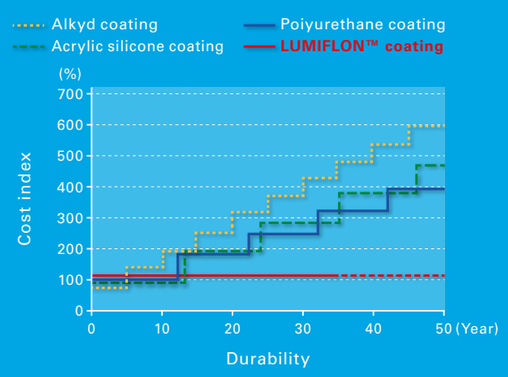
Fluororesin coatings have the longest durability.
Of all fluororesins, **3F FEVE** molecular structure is the best.



Coating cost image



Life cycle costs (LCC) compositon

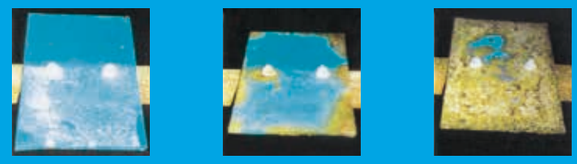


COMPARATIVE STUDIES

Exposure test

Duration:5 years
Location:Ocean shore
New/Repaint:Repaint
Paint system:Heavy duty

Upper half of the plates are shown after wiping.
Bottom half of the plates are covered with salt.



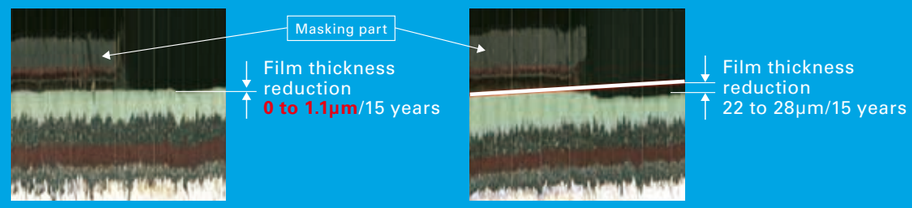
LUMIFLON™ coating: Good appearance

Chlorinated rubber coating: Rust at the corners

Alkyd coating: Covered with rust

Degree of coating film thickness reduction

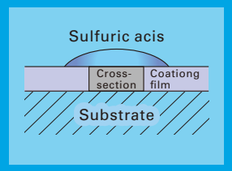
In the fluoropolymer coating using LUMIFLON™, little wear was observed over the 15 year period.
In contrast, wear of 2μm per year was observed in the polyurethane coating.



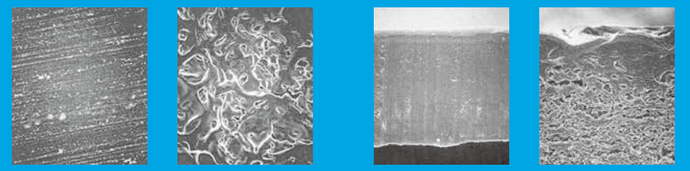
LUMIFLON™ coating
(after 15 years)

Polyurethane coating
(after 15 years)

Acid resistance test



10% sulfuric acid spot
(70°C × 1hour)



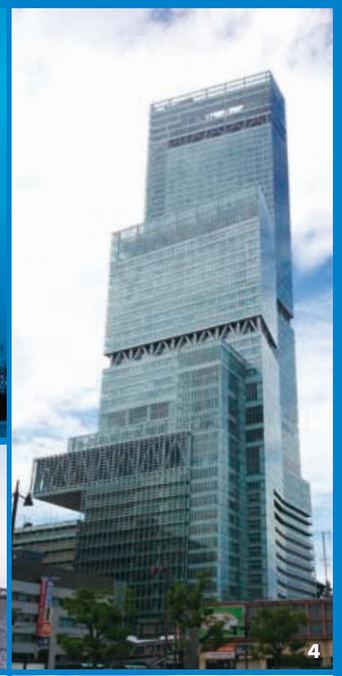
LUMIFLON™ coating: No change

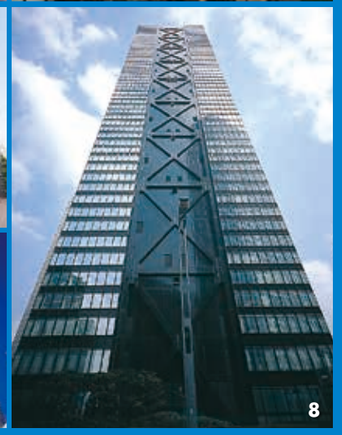
Acrylic coating: Severely damaged

LUMIFLON™ coating: No change

Acrylic coating: Severely damaged

LUMIFLON™ PROJECT HIGHLIGHTS





1. TOKYO SKYTREE™
Established:2012
Substrate:Steel

2. Alem Cultural and Entertainment Center
Established:2012
Substrate:Aluminum
(Product:ALPOLIC from Mitsubishi Chemical)

3. Tokyo Gate Bridge
Established:2012
Substrate:Steel

4. Abeno Harukas
Established:2014
Substrate:Aluminum

5. Akashi Kaikyo Bridge
Established:1998
Substrate:Steel

6. National Diet Libraly
Repaint:1986
Substrate:Concrete

7. Land Mark Tower
Established:1993
Substrate:Aluminum

8. Shinjuku Mitsui Building
Repaint:1998
Substrate:Aluminum

9. Marunouchi Building
Established:2001
Substrate:Concrete

10. Yushima-Seido
Repaint:1989
Substrate:Concrete

11. Tokiwa Bridge
Established:1986
Substrate:Steel

Product selection
LUMIFLON™ SOLVENT

Aircraft

Wind Turbines

Hospital Metropolitano Álvaro Cunqueiro
(Coating:Monopol Colors AG)

Yeongjung Bridge

Water Tank

Mode Gakuen Spiral Towers

LUMIFLON™ Solvent grades

Grade	LF200	LF552	LF600X	LF800	LF910LM
Features	Standard	Flexible	Flexible	Mild solvent	Low VOC, High solid
Solid Content* (wt%)	60	40	50	60	65
OH Value* (mg KOH/g-polymer)	52	52	54	33	103
Acid Value* (mg KOH/g-polymer)	0	5	0	2	0
Solvent	Xylene	Aromatic hydrocarbon, Cyclohexanone	Xylene	Mineral spirits	Xylene

*typical value

Application areas

- Architecture
- Coil coating
- Industrial
- Heavy duty
- Automotive
- Aerospace
- Marine
- Repaint

Product selection

LUMIFLON™ WATER BORNE

Okayama Castle

Industrial Tank

Shinjuku Toho Bulg.

The National Art Center

LUMIFLON™ Water borne grades

Grade	FE4300	FE4400	FD1000
Features	One component Emulsion	Crosslinkable Emulsion	Crosslinkable Dispersion
Solid Content* (wt%)	50	50	40
Ionic Character	Anionic	Anionic	Anionic
OH Value* (mg KOH/g-polymer)	10	49	85
Acid Value* (mg KOH/g-polymer)	—	—	15
MFT (°C)	30	55	29

*typical value

Application areas

- Architecture
- Metal
- Industrial
- Plastic
- Repaint

Product selection

LUMIFLON™ FLAKE/SOLID

Aldar Headquaters
(Product:ALPOLIC from Mitsubishi Chemical and powder coating by Akzo Nobel Coatings)

Shibuya Connecting Bridge

Pearl River Tower

Richmond City Hall

Ping An International Finance Centre

LUMIFLON™ Flake grade

Grade	LF710F
Features	High Tg, For powder paint
Solid Content* (wt%)	98.5 or higher
Tg* (°C)	51
OH Value* (mg KOH/g-polymer)	46

*typical value

Application areas

- Architecture
- Window frames
- Hydrants

LUMIFLON™ Solid grades

Grade	LF200F	LF916F
Features	LF200 flake type, Solvent-selectable	High hydroxyl value, Solvent-selectable
Solid Content* (wt%)	98 or higher	98 or higher
Tg* (°C)	35	35
OH Value* (mg KOH/g-polymer)	50	100

*typical value

Application areas

- Architecture
- Heavy duty
- Repaint

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MIX SAMPLE

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