Milano, 7 ottobre 2011

Rivestimenti per il mercato architettonico e delle infrastrutture: il caso Lumiflon come paradigma di durabilità e protezione

Convegno: Materiali compositi da rivestimento per l'edilizia storica e urbana

INNOVENTIONS srl - Via Alberto da Giussano 3C/1 – 20092 Cinisello Balsamo (MI)
tel 02.6428117, fax 02.66112057 www.innoventions.it

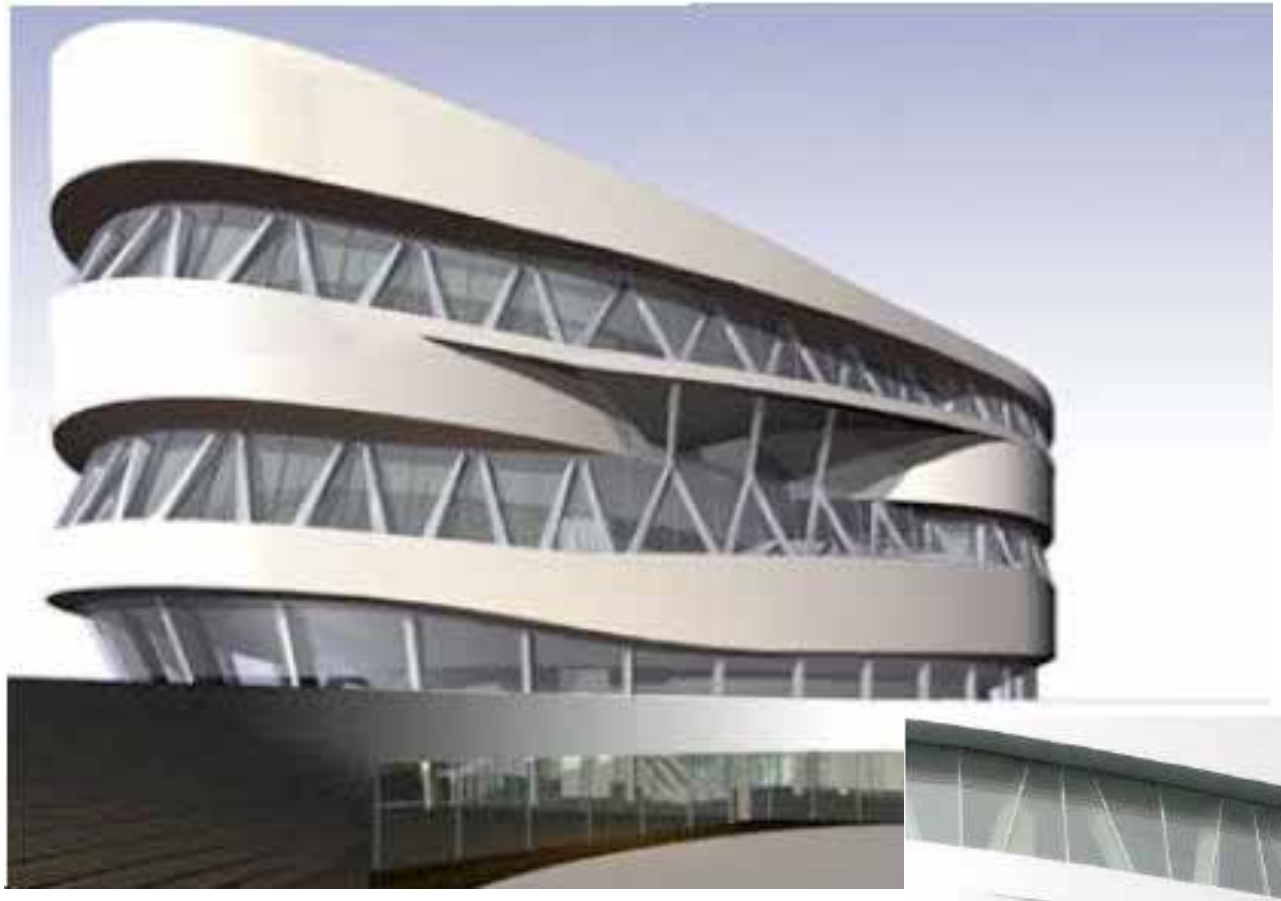
Ponte Akashi
Il più grande ponte sospeso al mondo

Tirreno Power
Sala macchine Centrale Napoli Levante

A2A – Camino
Termovalorizzatore Brescia

Esselunga
Piacenza – Via Conciliazione

Auchan – Antegnate
Pitture Fluorcoat su calcestruzzo prefabbricato

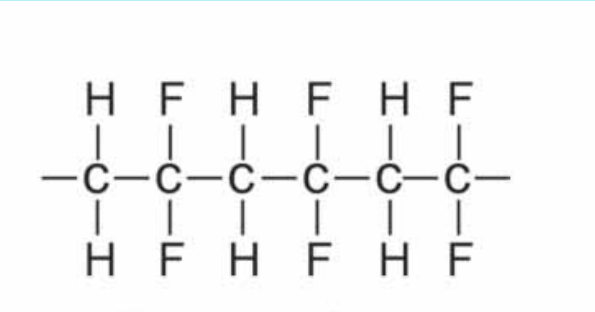


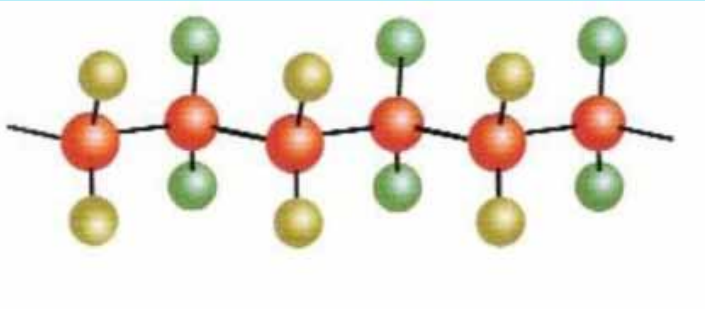
Museo Mercedes
Stuttgart
Alluminio preverniciato

Abu Dhabi, Ferrari Park,
2 strati PVDF (fondo e colore) + topcoat trasparente a base Lumiflon

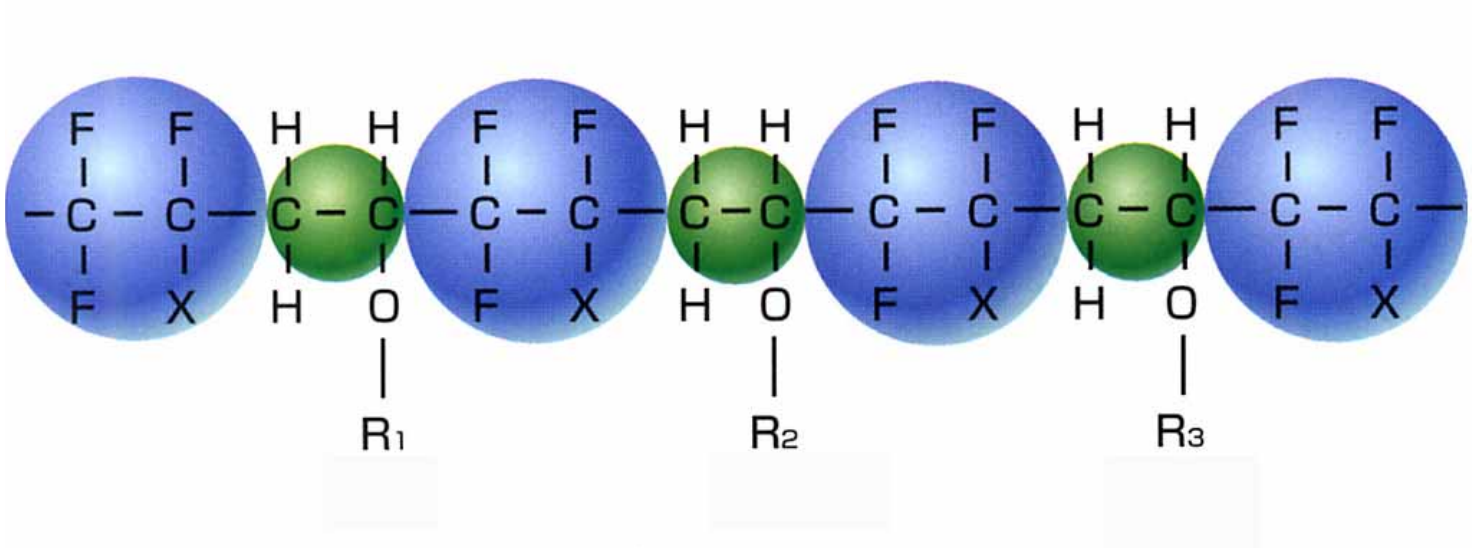
I polimeri fluorurati di partenza

PVDF, anni ’60 Pennwalt





LUMIFLON anni ’80 AGC



Funzioni/performance

di rivestimenti a base di Lumiflon

Legame carbonio - fluoro (C – F) è il più stabile legame chimico nei rivestimenti organici

↓ ↓ ↓ ↓ ↓

- Resistenza alla foto-ossidazione (climi tropicali, alta radiazione UV anche a quote elevate)
- Resistenza chimica (grattacieli, ponti, impianti chimici e petrolchimici, aree inquinate, ambiente marino ed urbano)
- Resistenza agli shock termici (climi polari e tropicali, aerospazio)

Fattori critici di successo

I rivestimenti da Fluorcoat (a base Lumiflon) sono utilizzati nei seguenti settori

Non è richiesta nessuna manutenzione

Lunga Vita utile

Severo attacco chimico (cloruri, ecc.)

Condizioni climatiche estreme (poli, tropici, shock termici)

Ambienti abrasivi (deserti, polveri da camini)

Formazione di macchie da smog, guano ecc.

Legislazione ambientale riduzione VOC**.**

Test Interni di qualifica - 1

Test	Method	Fluorcoat s.101 AAMA 2065.2	*PVDF based paint AAMA 2605.2*
Thickness		40 µm top – 220 µm total	20 µm top – 27 µm total
Adhesion (Cross cut)	ASTM D 3359 –78	100%	100%
Pencil Hardness	ASTM 3363	HB - 2 H	HB – F
Double Rub test MEK	AICC 23	>150	>150
Gloss (60°)	ASTM D 523	10 – 85	10 – 45
Impact test	ASTM D 2794	> 1 kg/ 50 cm	> 1 kg/ 50 cm
Dipping in boiling water (4 hr) and deionized water (14 days, RT)	ASTM D 870 NOT REQUESTED	No variation	No variation
Cold Check, 20 cycles	UNI 9429 - *16 hr dipping, 4 hr/-18°C, 4 hr/+60°C* *NOT REQUESTED*	No blistering adhesion 100%	No blistering adhesion 100%
Abrasion Resistance	ASTM D 1044 Taber test	< 10 mg/ 1kcycle/1kg CS 10	< 10 mg/ 1kcycle/1kg CS 10
Abrasion Resistance (falling sand)	ASTM 968	Gloss var. < 10%	Gloss var. < 10%
Contact angle with water	Internal method *NOT REQUESTED*	85 – 105 µ	60 – 90 µ
Contact angle with oil	Internal method *NOT REQUESTED*	40 – 60 µ	20 – 30 µ

Test Interni di qualifica - 2

Test	Method	Fluorcoat s.101	*PVDF based paint*
Q-UV-B test (5000 hours, 313 nm UV-B)	ASTM G 53; *4 hr light/60°C 4 hr dark/40°C*	¥ gloss < 10% ¥ colour < 5	¥ gloss < 10% ¥ colour < 5
Weather O Meter (6000 hr, 340 nm UV-A)	ASTM G23	¥ gloss < 10% ¥ colour < 5	¥ gloss < 10% ¥ colour < 5
Salt spray test (4000 hours)	ASTM B117	Passed	Passed
Film erosion	ONLY from AAMA	0,2 – 0,4 ¥m/yr	0,25 ¥m/yr
Chemical resistance			
Mortar 48 hr RT	ECCA T7	No blistering adhesion 100%	No blistering adhesion 100%
Toluene 40 days @ 25°C	ASTM 3023	No blistering adhesion 100%	No blistering adhesion 100%
Hydrochloric acid Cl 10% 40 days @ 25°C	ASTM 3023	No blistering adhesion 100%	No blistering adhesion 100%
Sulphuric acid 30% 40 days @ 25°C	ASTM 3023	No blistering adhesion 100%	No blistering adhesion 100%
Nitric acid 30% 1 day @ 25°C	ASTM 3023	No blistering adhesion 100%	¥ colour < 5
Caustic 10% 40 days @ 25°C	ASTM 3023	No blistering adhesion 100%	No blistering adhesion 100%

Test di qualifica di mercato 3

I rivestimenti fluorurato sono gli
unici a superare
le prescrizione di
AAMA 2605.2:

10 anni esposizione in Florida

La maggior parte dei rivestimenti
Fluorurati non è mai
stata oggetto di
manutenzione

Tokyo Shinjuku - Yasuda Kasai Building, 1982 – GRC mai riverniciato

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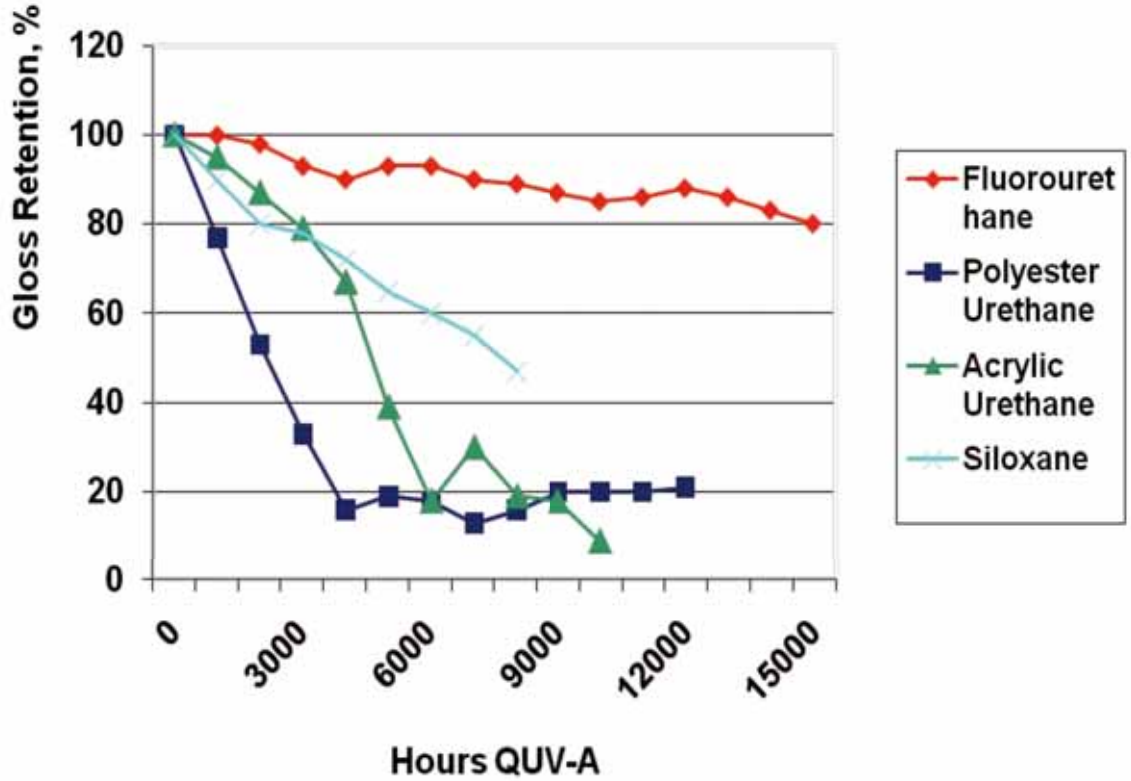
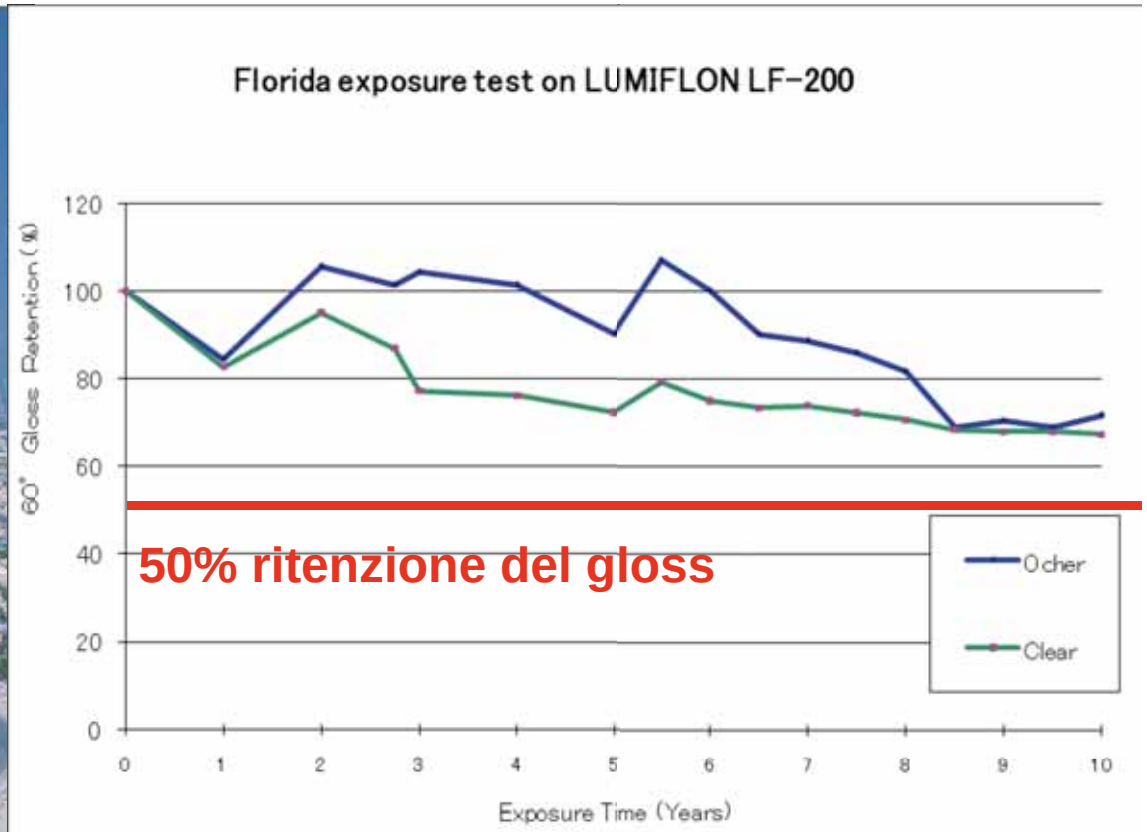
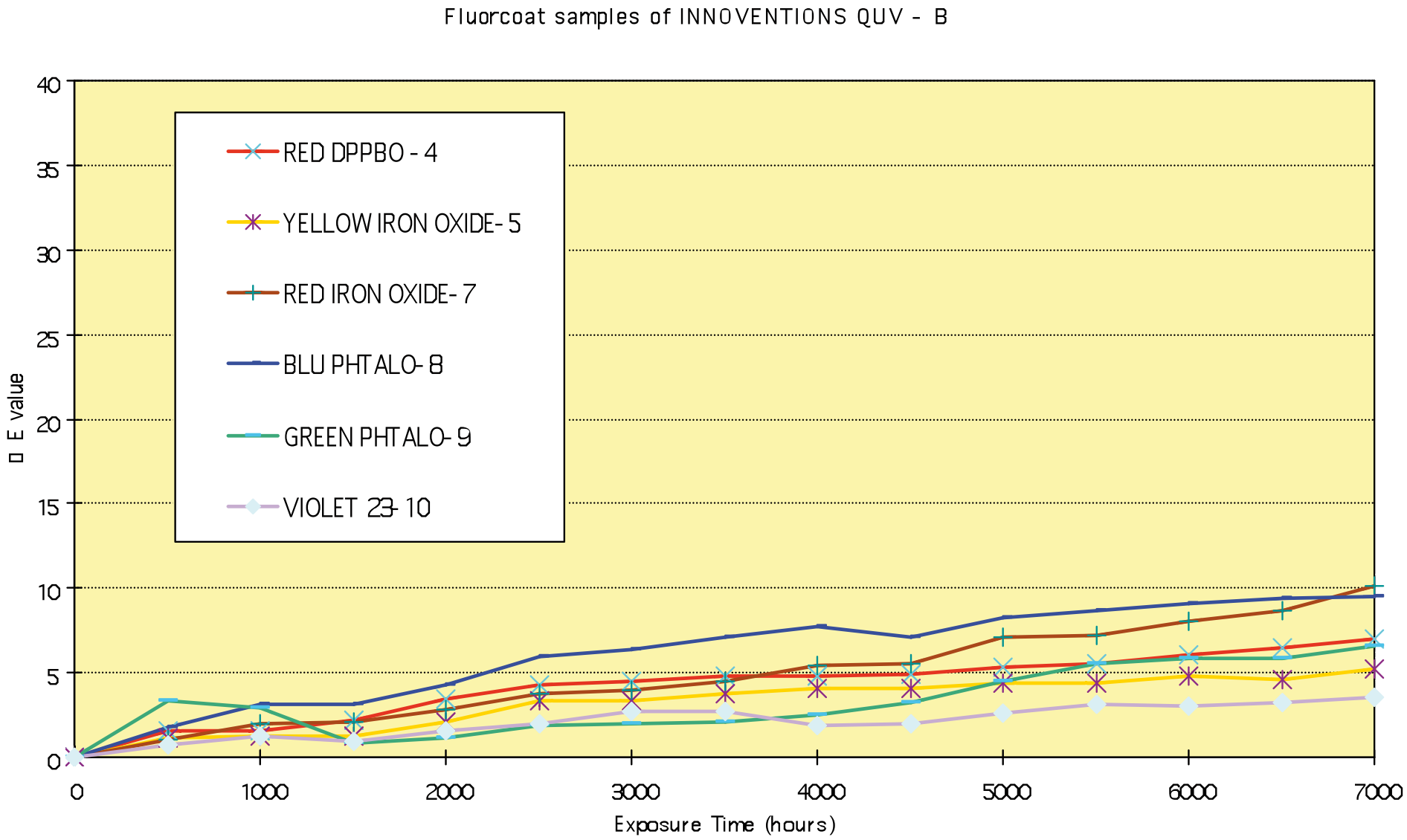
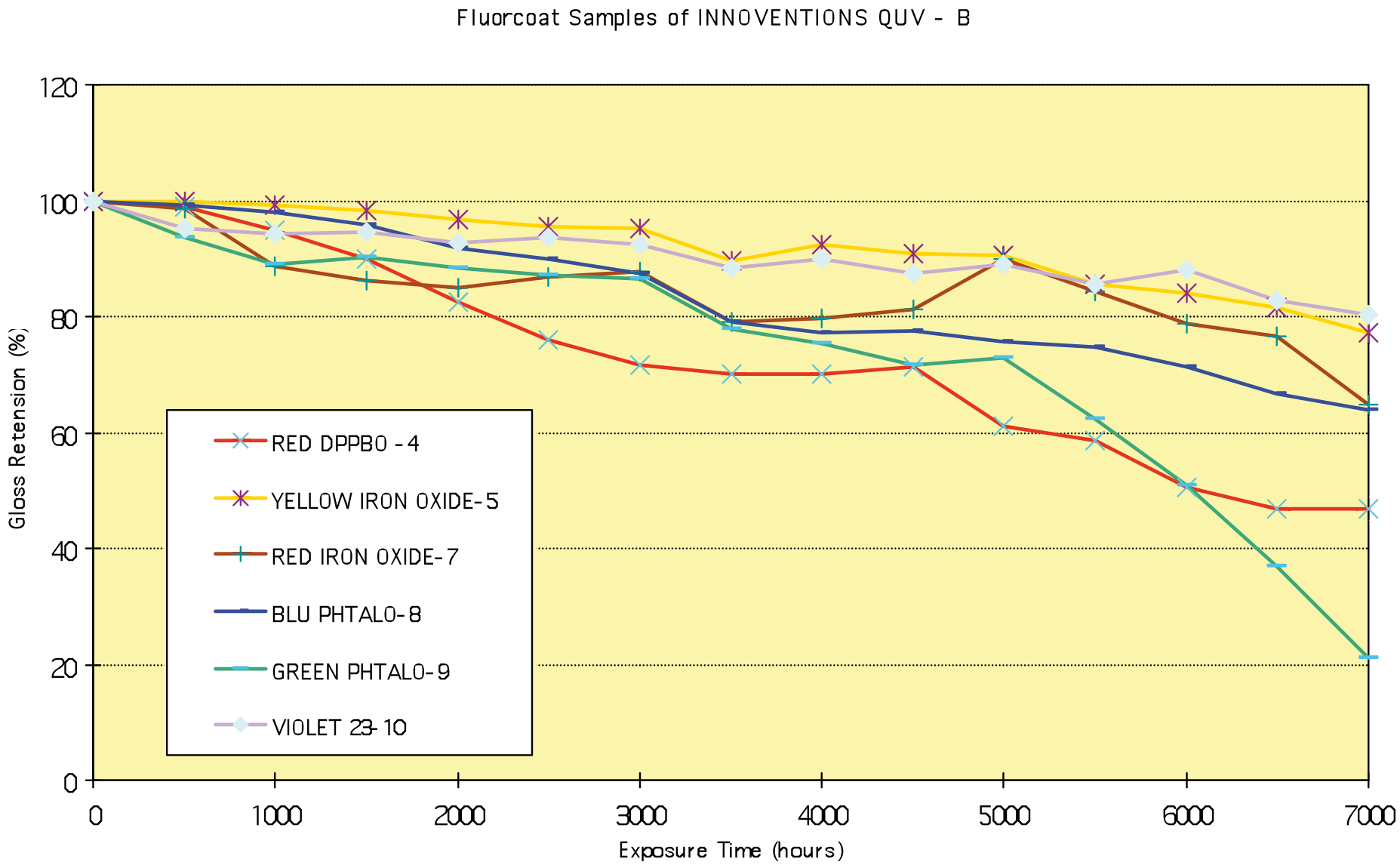
Performance Chemicals & Systems

AGC




Florida exposure test on LUMIFLON LF-200
60° Gloss Retention (%)
120
100
80
60
40
20
0
0
1
2
3
4
5
6
7
8
9
10
Exposure Time (Years)
Ocher
Clear
50% ritenzione del gloss


Fluorcoat samples of INNOVENTIONS QUV - B
RED DPPBO - 4
YELLOW IRON OXIDE- 5
RED IRON OXIDE- 7
BLU PHTALO- 8
GREEN PHTALO- 9
VIOLET 23- 10
□ E value
0
5
10
15
20
25
30
35
40
0
1000
2000
3000
4000
5000
6000
7000
Exposure Time (hours)

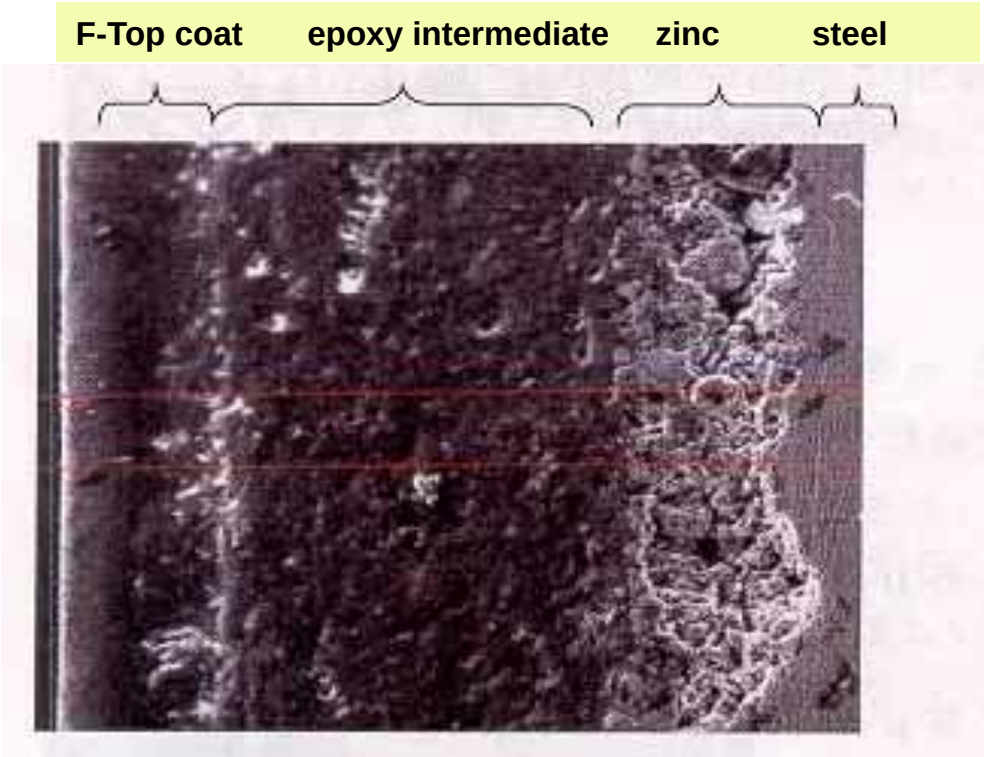

Fluorcoat Samples of INNOVENTIONS QUV - B
Gloss Retension (%)
120
100
80
60
40
20
0
0
1000
2000
3000
4000
5000
6000
7000
Exposure Time (hours)
RED DPPBO -4
YELLOW IRON OXIDE-5
RED IRON OXIDE-7
BLU PHTALO-8
GREEN PHTALO-9
VIOLET 23-10

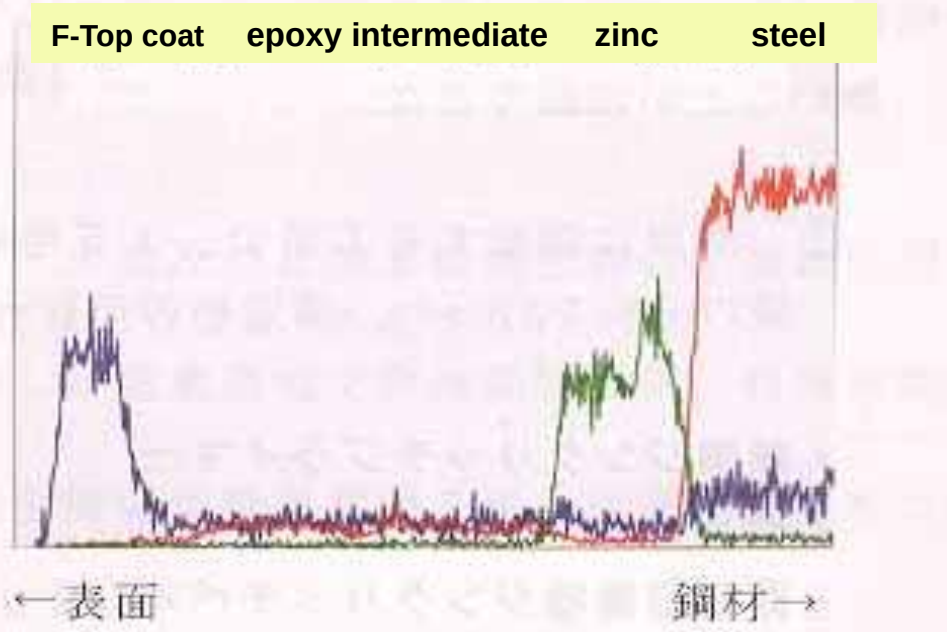
Report del Ministero Giapponese dei Trasporti, Infrastrutture & Territorio pubblicato nel 2002 dal Jap. Paint Ind. Magazine

Iniziale			Dopo 16 anni		
Surface treatment	Prodotto	Spesori (µm)	**Variation spessori (µm/anni) (C)**	**Cloruri (A)**	**Formazion Ossidi Zinc (B)**
Sabbiature	SA3 according ISO 8501	**30 – 50**			
Primer	Zinc inorganic (ethyl silicate)	**75**	**0**	**No**	**No**
Intermedio	Epoxypolyaminoamide	**125**	**0**	**No**	**No**
Tie coat	Epoxypolyaminoamide	**30**	**0**	**No**	**No**
Finitura	**Fluorocoating**	**30**	**0,33 -0,44**	**No**	**No**

A) Nessun penetrazioni di cloruri (effetto barriera costante nel tempo)
B) Nessuna formazione di ossidi di zinco: protezione elettrochimica costante nel tempo per 16 anni
C) Variazione di spessore da sfarinamento: 0,33 – 0,45 µm/yrs: durata attesa > 60 anni

Analisi al SEM ed EDX dopo 16 anni

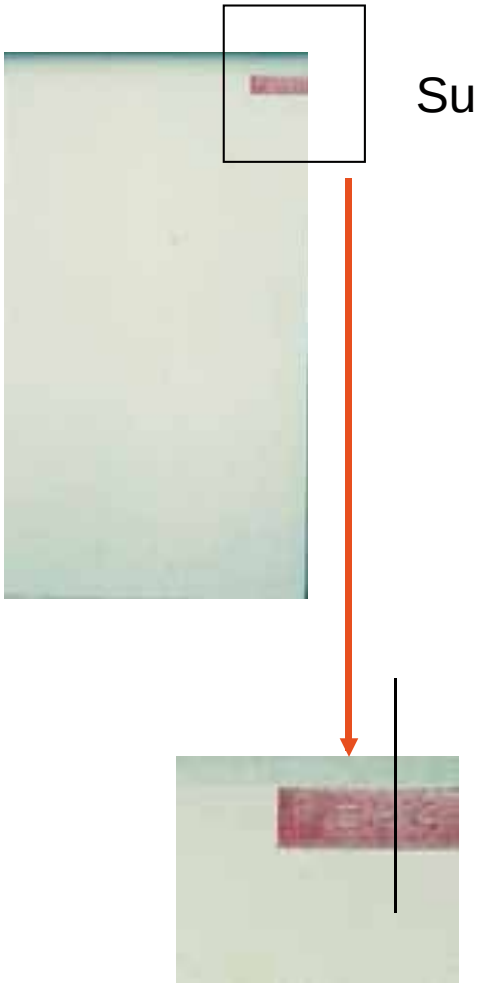




SEM MICROSCOPY
Cross section of the film observed by SEM: from left
It is apparent fluorocoating layer, epoxy layer
Zinc layer and sand blasting profile

ELEMENTAL ANALYS BY EDX
Chlorine content measurement in the cross section of the film (violet)
from left is apparent the line of chlorin content in fluorocoating,
absence of chlorine in epoxy layer and zinco layer, small quantity
onto steel due to the previous operations

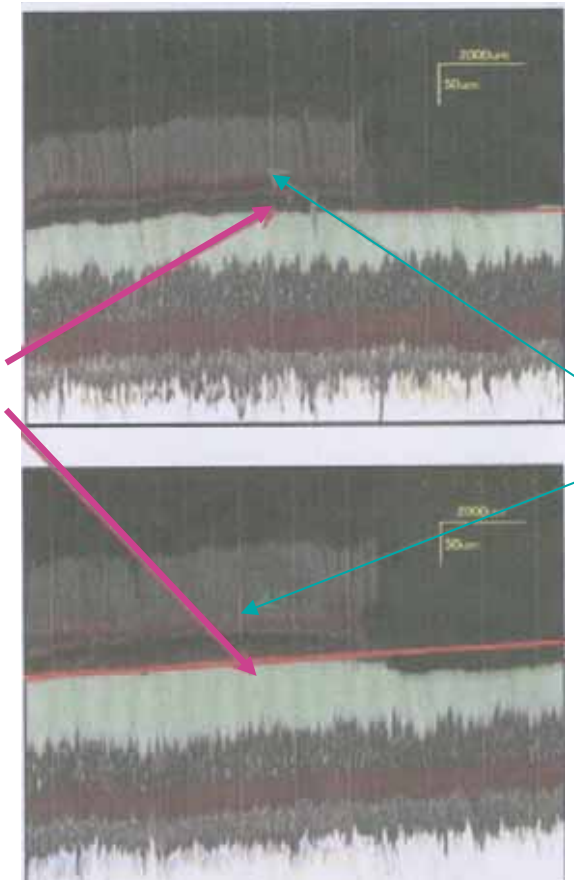
Campioni esposti ad Okinawa per **15 anni**: alta concentrazione UV, clima tropicale, vicino al mare



Superficie tagliata

Sezione per microscopia elettronica

Fluorcoat top coat



Top coat

Nastro adesivo

PU top coat

Δ spessore
1,0 μm
in15 anni
< 0,1 μm/yr

Δ spessore
35 μm
in 15 anni
> 2 μm/yr

Lombardini: Mapello (BG)

Autobrennero: viadotto Serravalle 1 – Rovereto Sud

Autobrennero: viadotto Sdruzzinà – Ala (TN)

Grazie per l'attenzione
Fly high with Lumiflon & Fluorcoat by Innoventions