



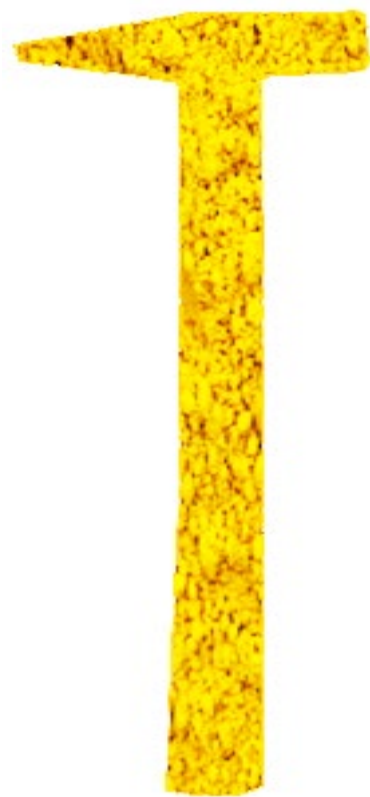
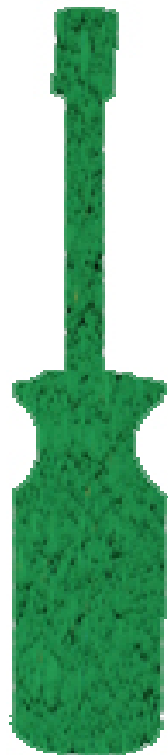
Expanding the Durable Color Envelope: NTP Yellow RTZ Orange

Mark Ryan
Marketing Manager



The Shepherd Color Company

We Brighten Lives







Complex

Inorganic

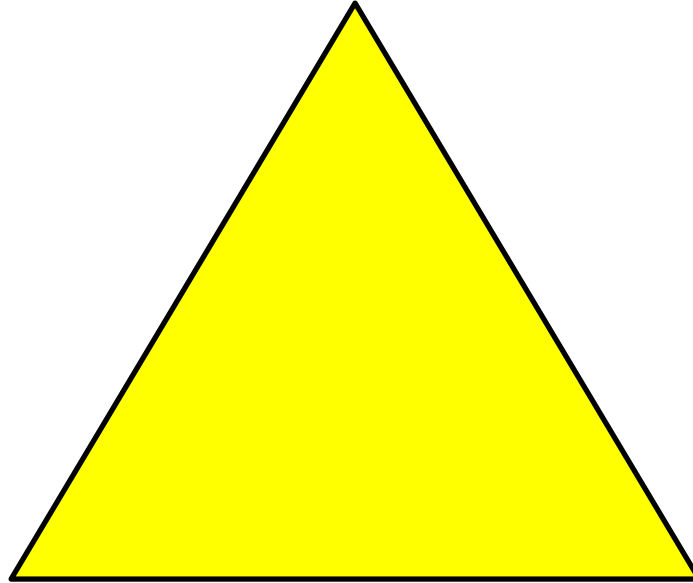
Color

Pigment





Chromaticity



Opacity

Durability

Expanding the Durable Color Envelope

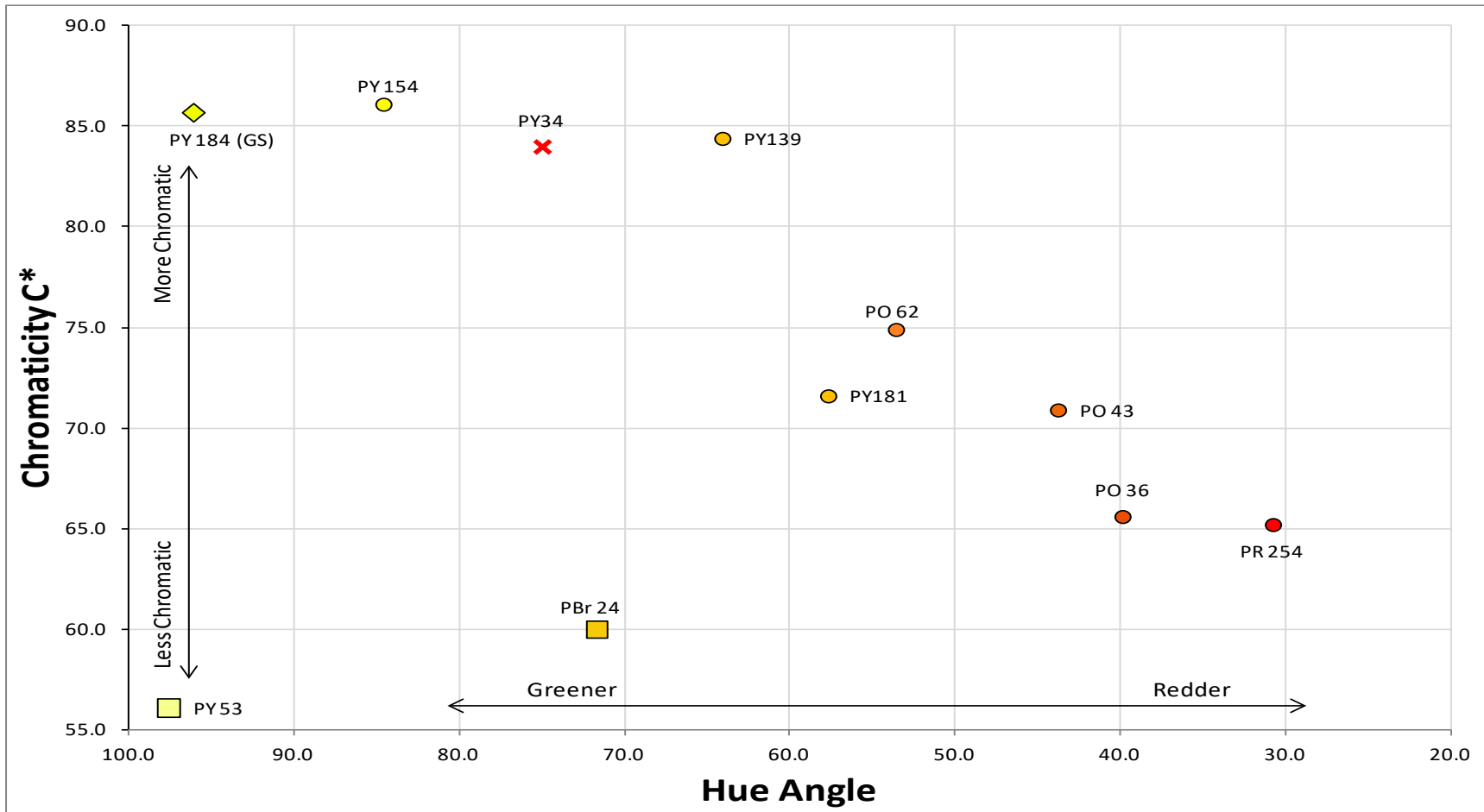


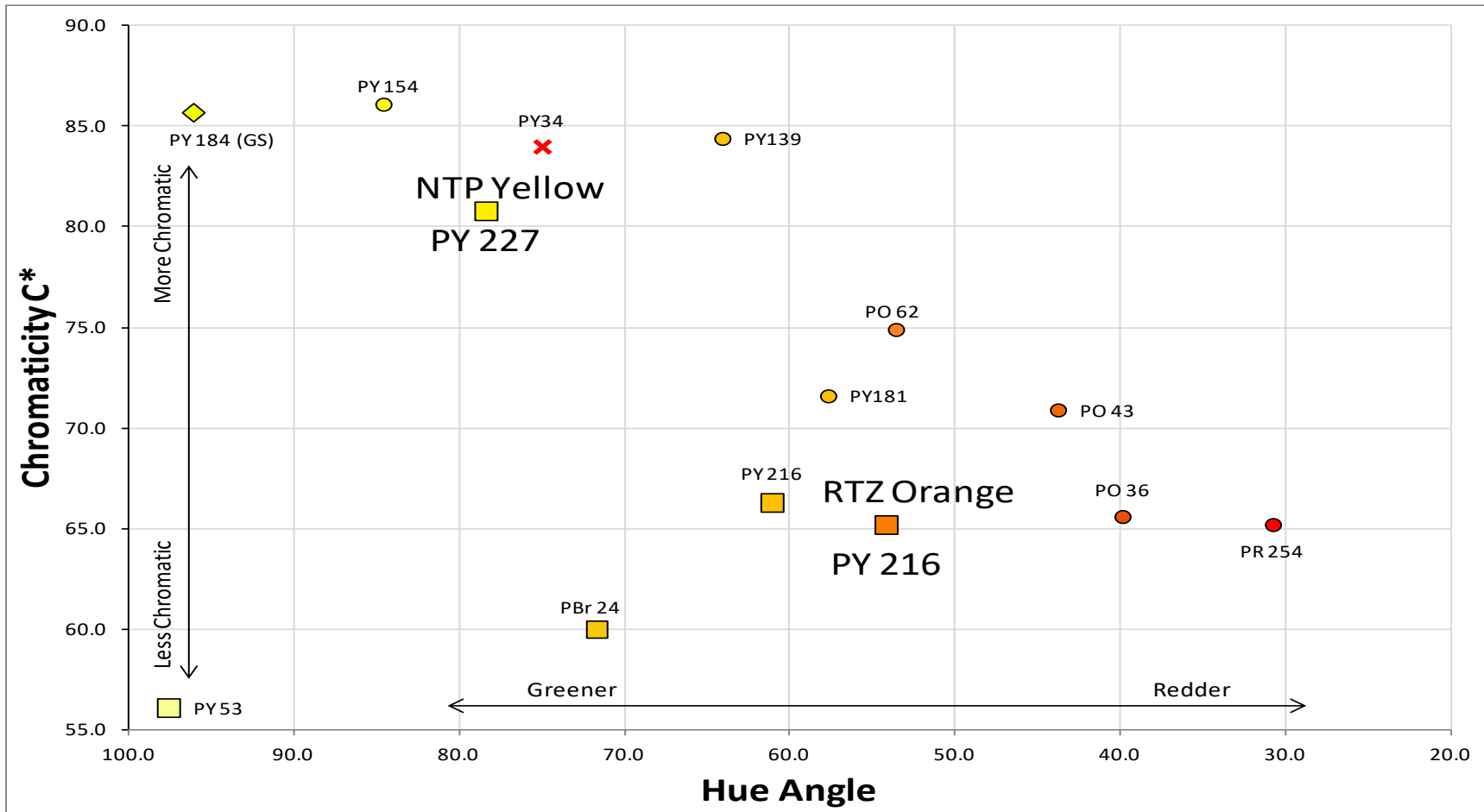
Chromaticity, Opacity and Durability

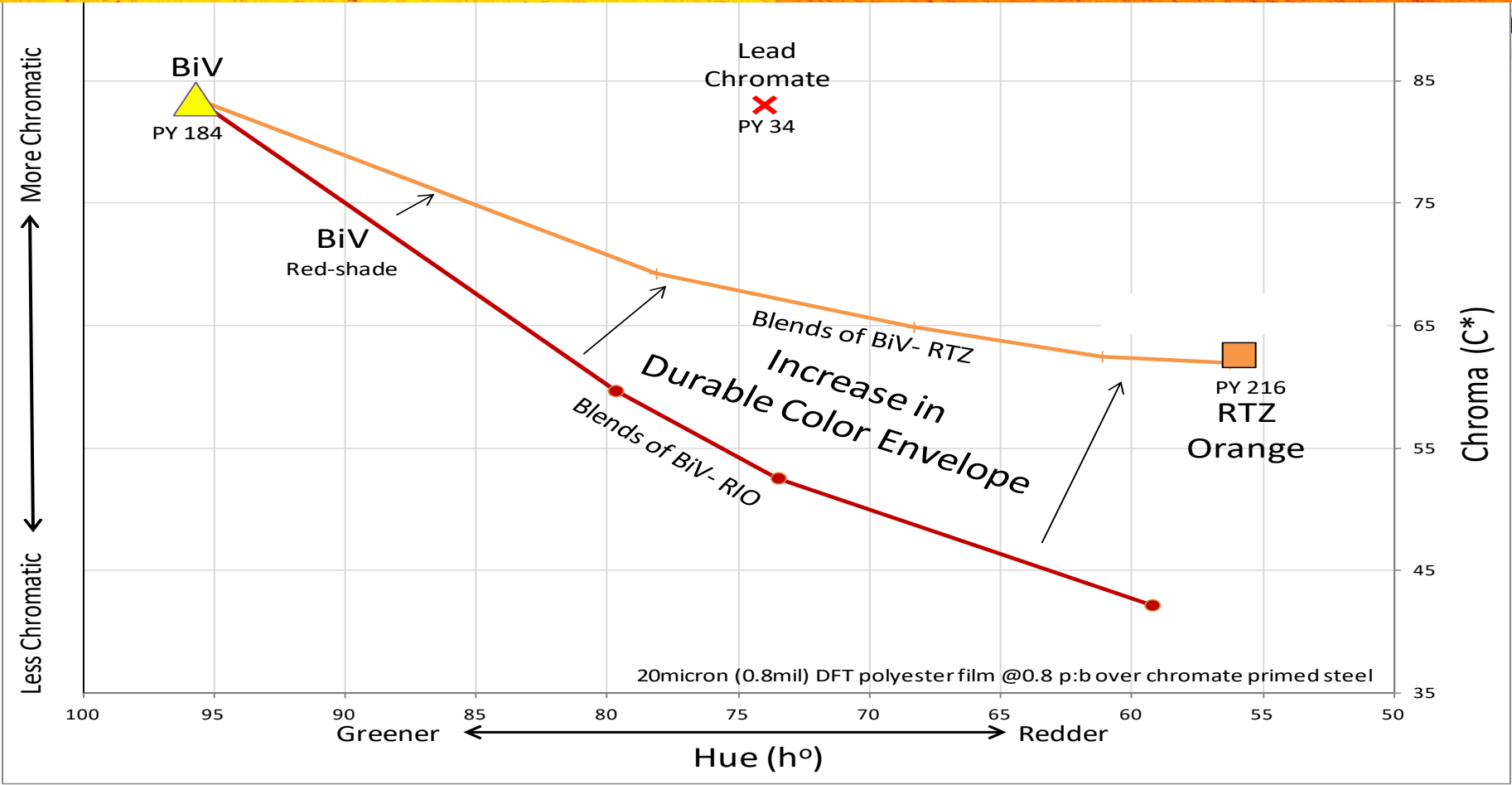
NTP Yellow & Improved RTZ Orange

Niobium Tin Pyrochlore Yellow (CI PY227) and Rutile Tin Zinc Orange (CI PY216)

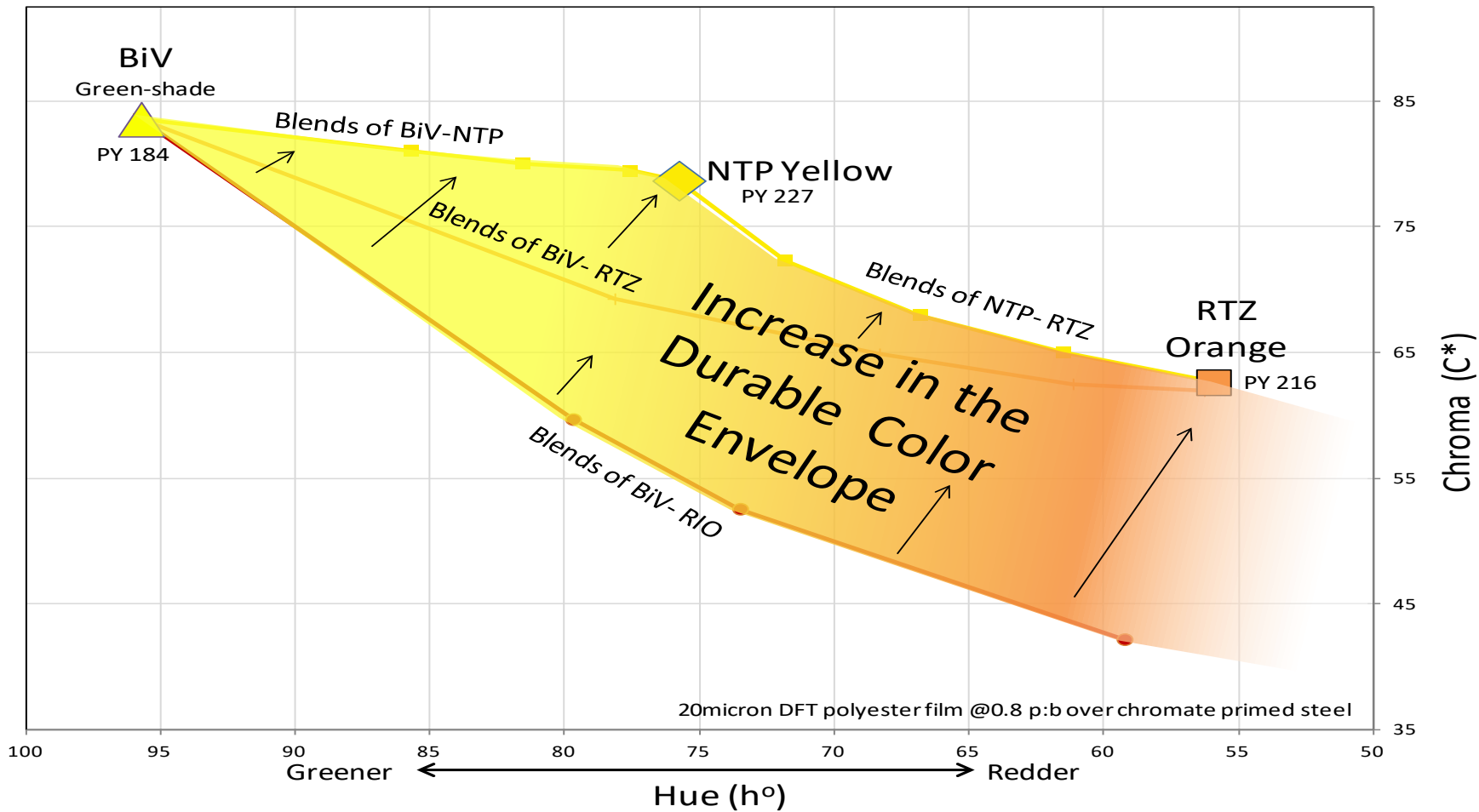




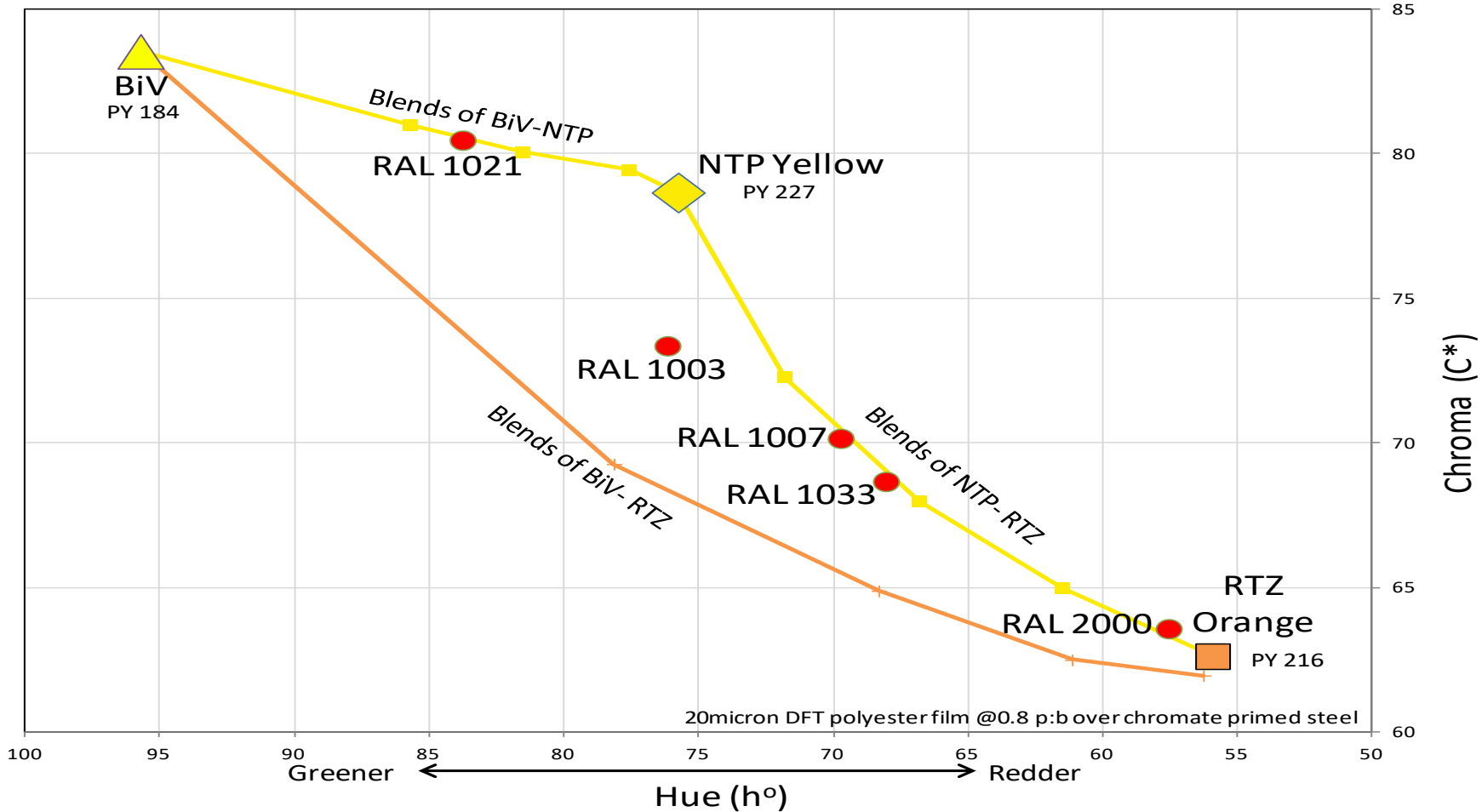




More Chromatic
↑
↓
Less Chromatic



More Chromatic
↑
↓
Less Chromatic



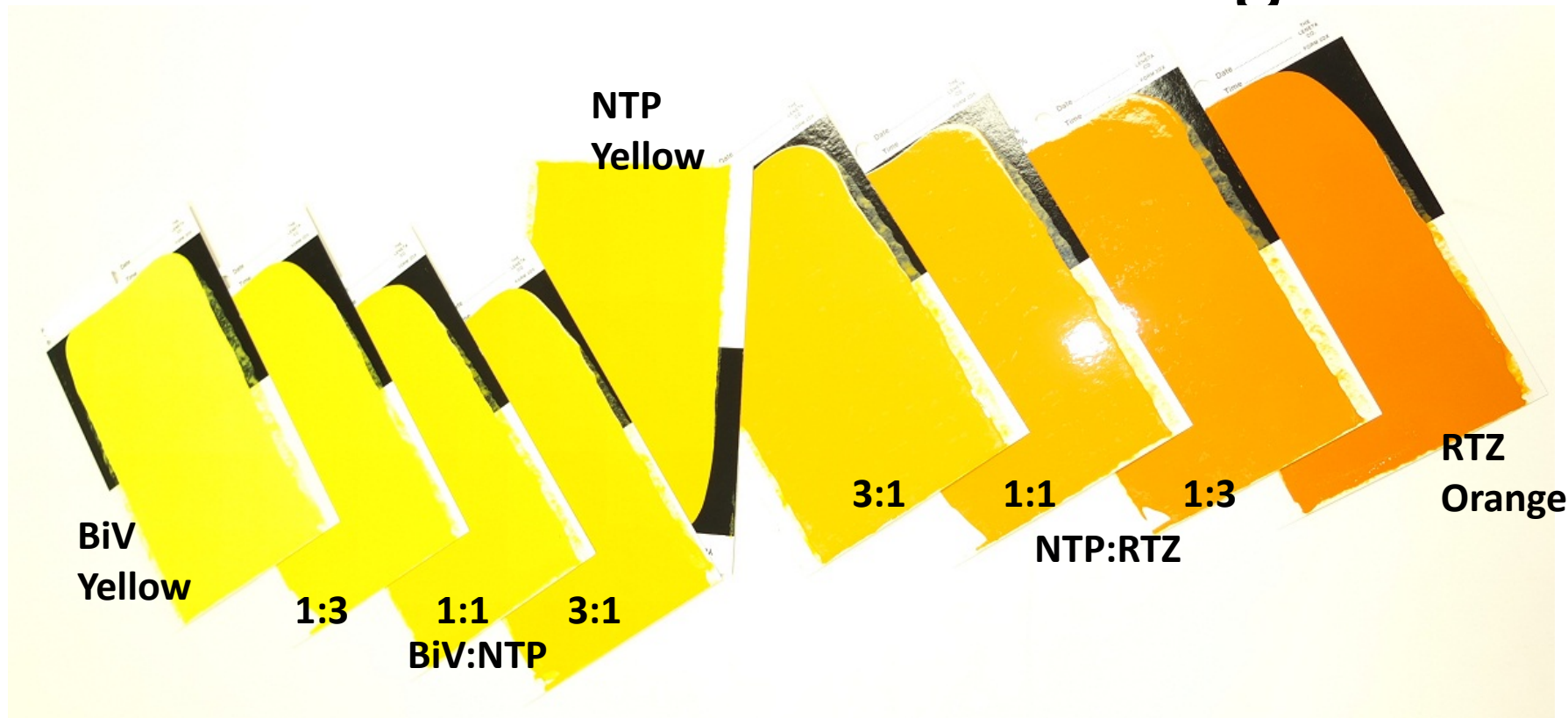
NTP Yellow with RTZ Orange



- Excellent range of red-shade yellow thru true orange
- Stable color to heat, acids, bases and weathering
- High opacity
- No deprecated metals

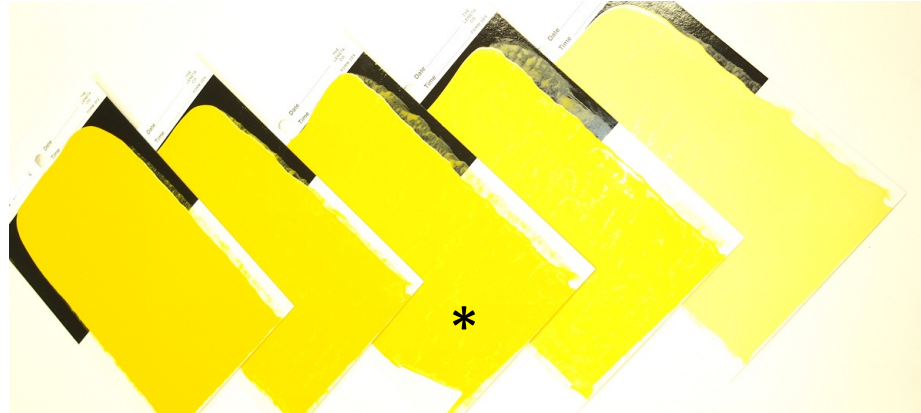
**The color envelope frontier in
environmentally friendly durable color**

BiV-NTP-RTZ Color Range



NTP Yellow Blends with Titanates

(100% NTP, 75%, 50%, 25%, 100%Titanate)



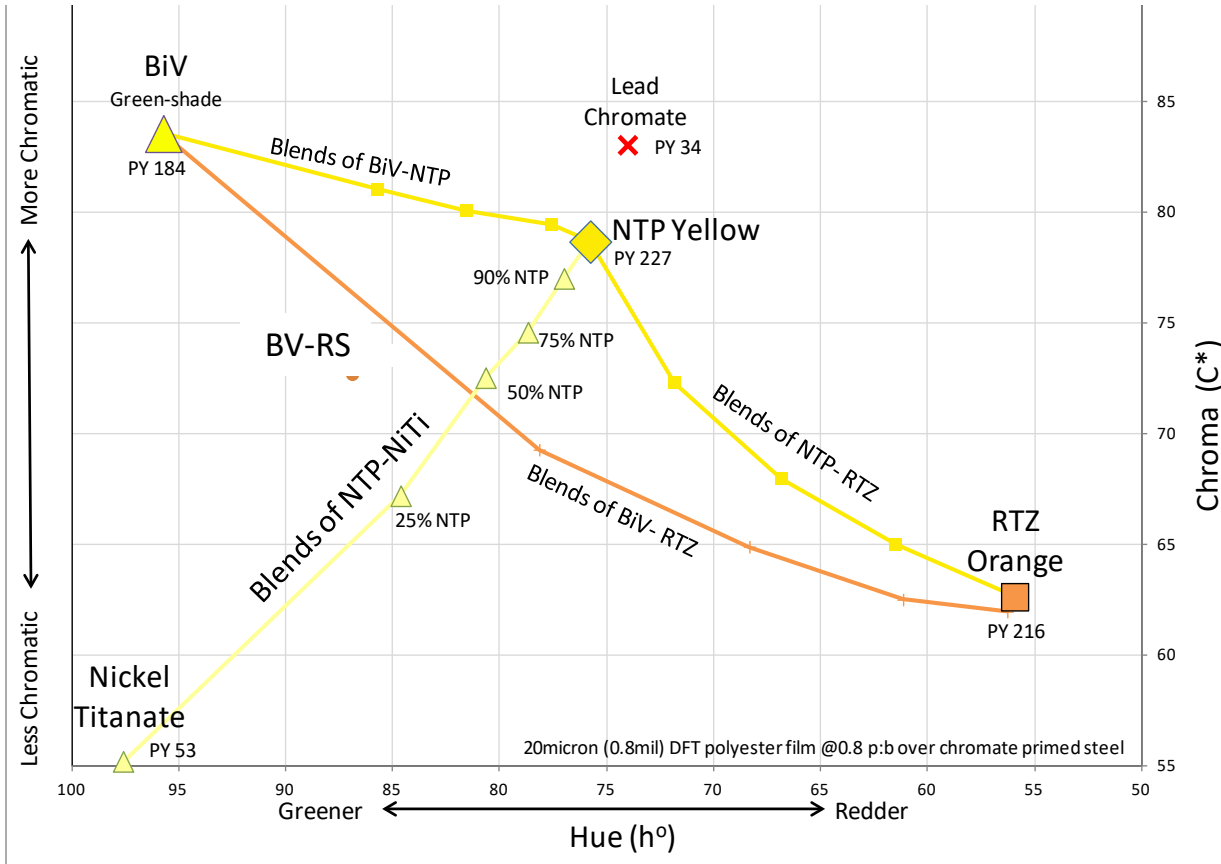
- Excellent preservation of NTP color when blended with P.Y. 53
- 1:1 Blend of NTP Yellow and PY53* color difference (NTP=STD)

<u>DL*</u>	<u>Da*</u>	<u>Db*</u>	<u>DE*</u>	<u>DC*</u>	<u>DH*</u>
1.7	-4.6	-1.3	5.0	-2.2	4.2



- Very high opacity when blended with P.Br. 24
- Excellent way to match red shades RAL 1000 series

Coloring Power of NTP Yellow

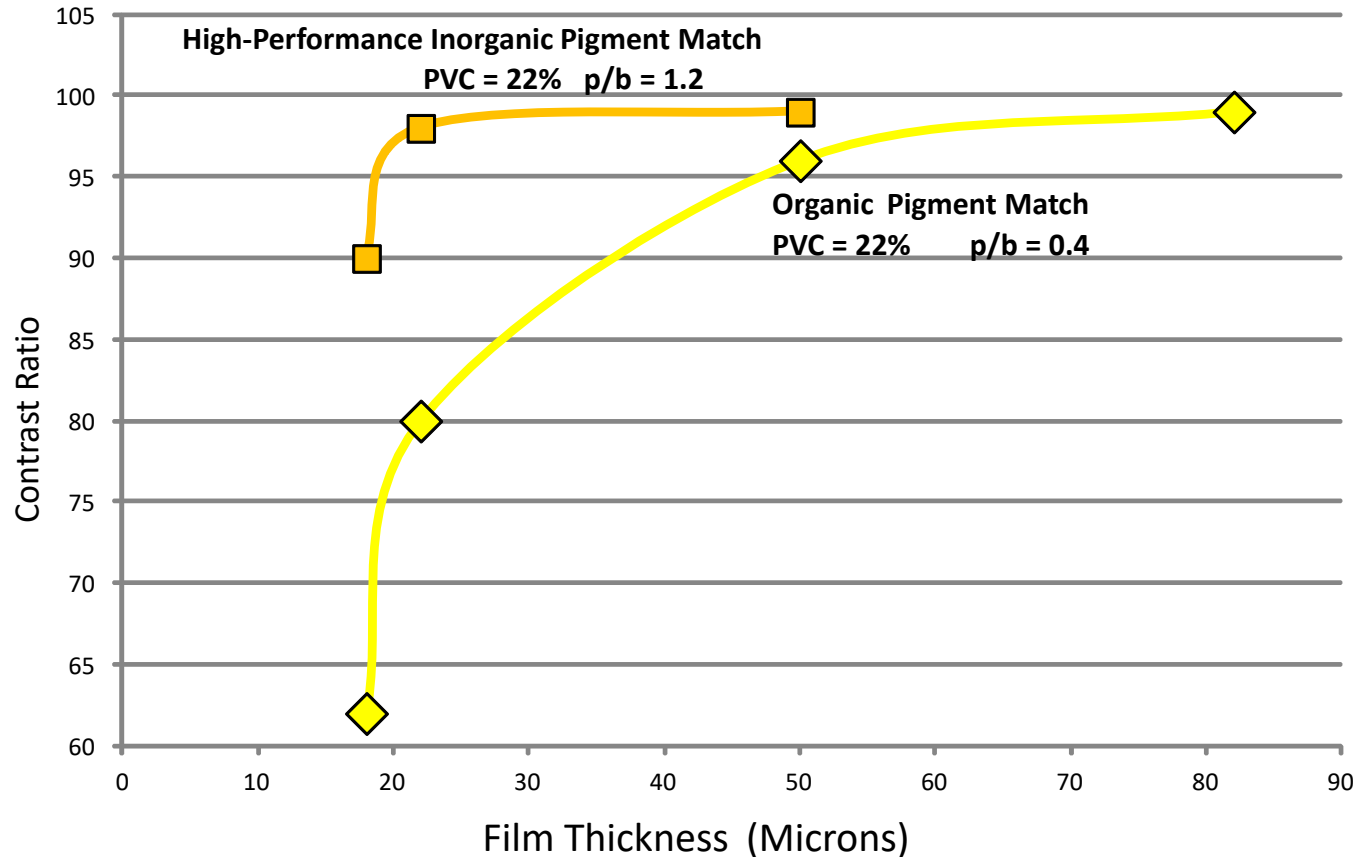


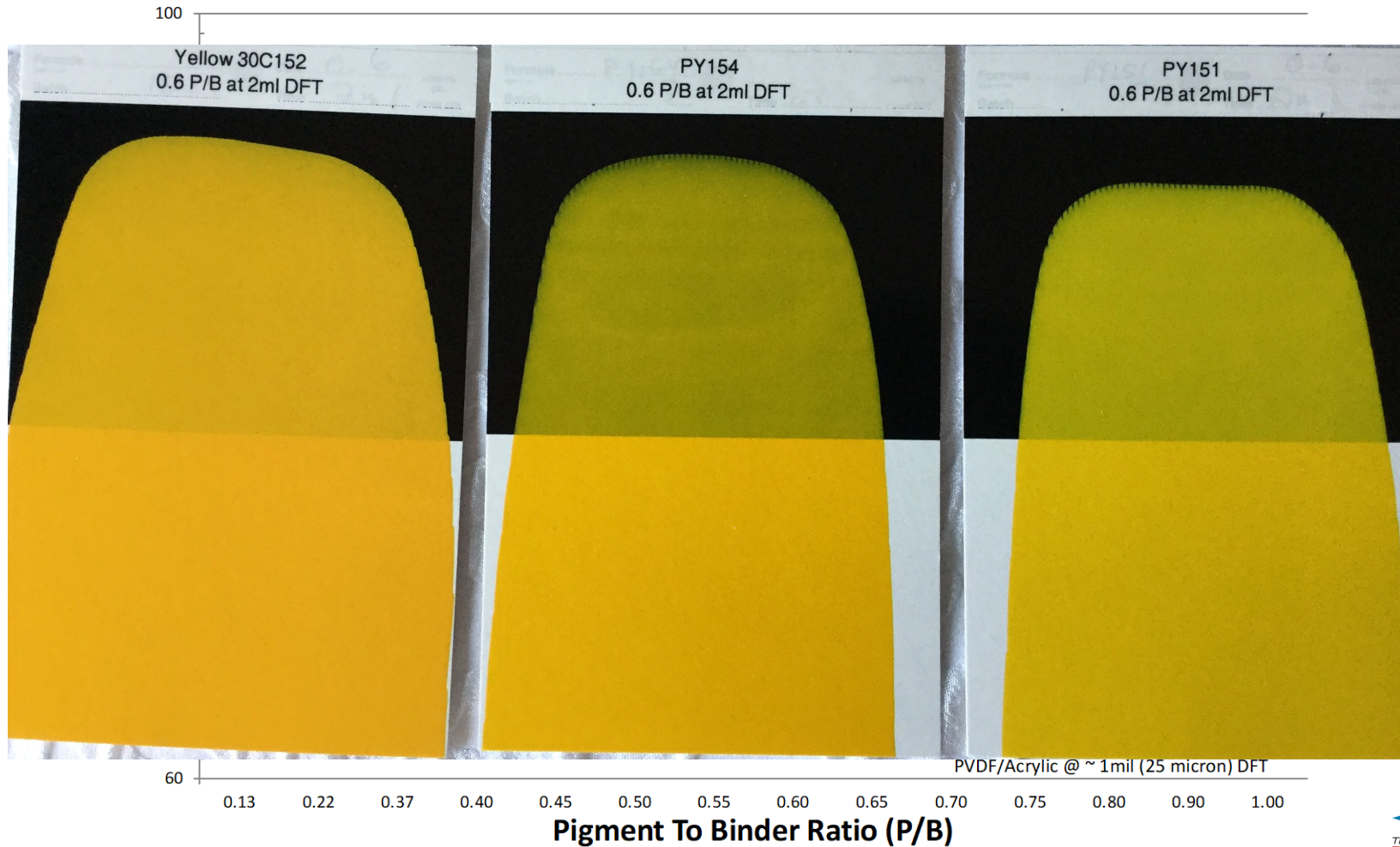
RAL 1003 Matches

Pigment	Chemistry	High Performance	BiV Based	Organic
P.Y. 154	Benzimidazolone			67.2
P.Y. 184	Bismuth Vanadate		67.0	
P.Y. 216	Rutile Tin Zinc	4.5		
P.Br. 24	Chromium Titanate	23.0	22.0	
NTP Yellow	Niobium Tin Pyrochlore	72.5		
P.Y.139	Isoindoline		8.0	
P.O. 62	Benzimidazolone			10.2
P.Bk. 7	Carbon Black			0.1
P.W. 6	Titanium Dioxide			22.5

	5000 Hours QUV in PMMA Plaque			
	dL	da	db	dE
NTP Based	-0.7	-1.5	-1.9	2.5
Organic Pigments	-1.0	-2.0	-4.0	4.6
BV+Organics	-0.7	-2.3	-3.1	3.9

RAL 1003 Color Match with Organic vs Inorganic Pigments





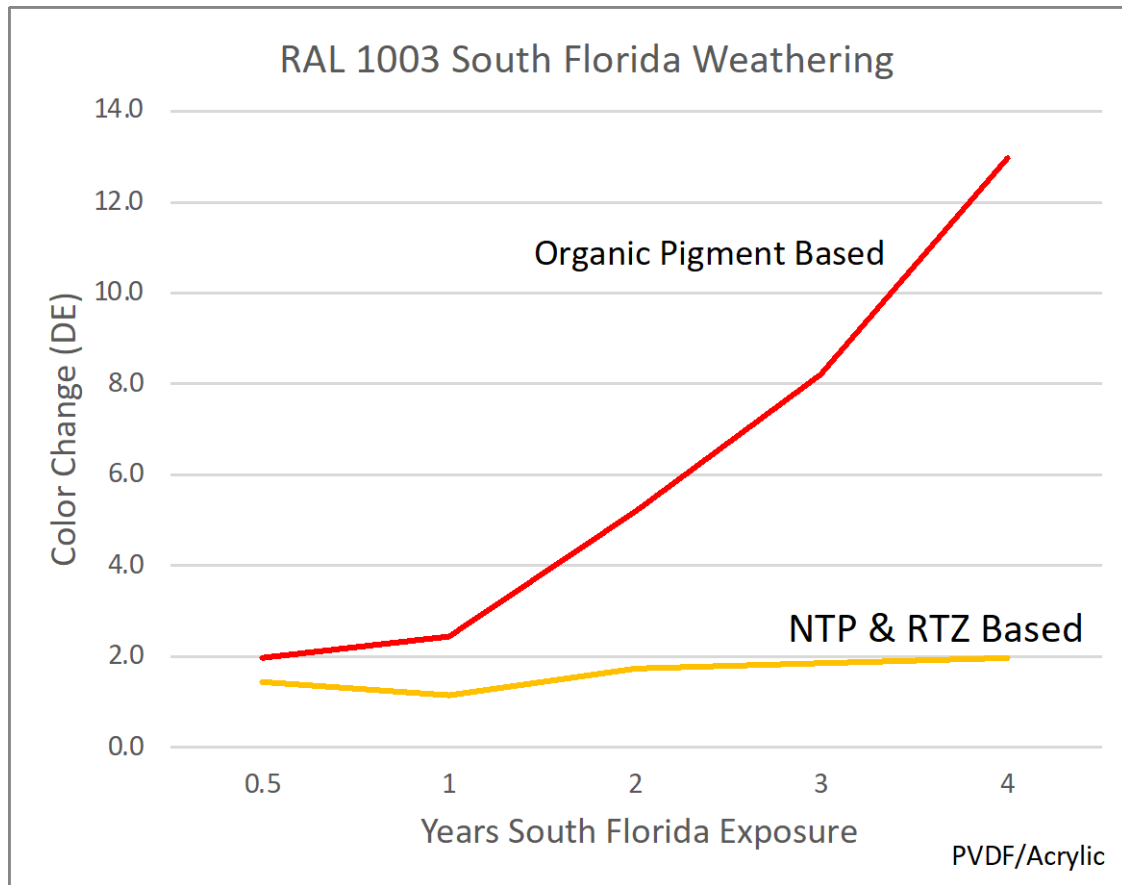
Cost-to-Opacity

Material	Pigment Formula	Pigment Formula	
		NTP Based	Organic Based
P.Y. 154	Benzimidazolone		55%
P.Y. 181	Mono Azo		11%
P.Y. 53	Nickel Titanate	24%	
P.Br. 24	Chromium Titanate	10%	
P.Y.227	Niobium Tin Pyrochlore	66%	
P.W. 6	Titanium Dioxide		34%
		100%	100%



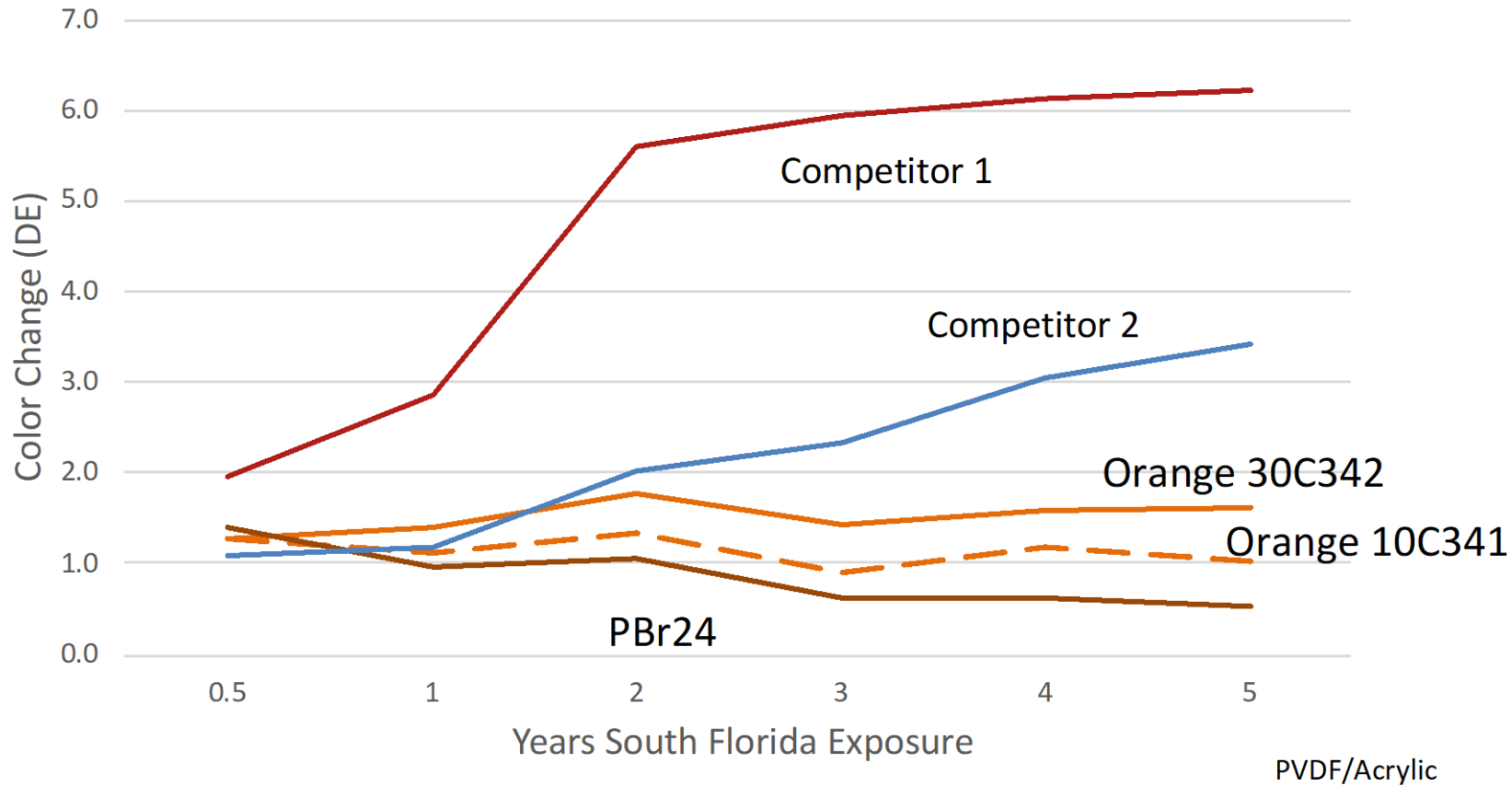
	Costs	NTP Based	Organic Based
	DFT Required (microns)	22	46
	Cost	194.76	311.16
	Relative Cost Ratio	1.0	1.6

PVDF/Acrylic Mass Stone		Years of Exposure					
		0.5	1	2	3	4	
RAL 1003 Match	Inorganic	ΔL^*	-0.6	-0.4	-0.2	-0.1	-0.3
		Δa^*	0.0	0.2	0.2	0.1	0.1
		Δb^*	-1.4	-1.1	-1.7	-1.9	-2.0
		ΔE^*	1.5	1.2	1.8	1.9	2.0
		ΔG^*	2.0	1.5	-1.5	-6.0	-13.0
RAL 1003 Match	Organic	ΔL^*	-0.5	0.1	0.9	1.5	1.6
		Δa^*	-0.7	-1.5	-3.0	-4.1	-4.8
		Δb^*	-1.8	-2.0	-4.1	-7.0	-11.9
		ΔE^*	2.0	2.5	5.2	8.2	12.9
		ΔG^*	4.0	2.5	-3.0	-7.5	-14.5



RTZ

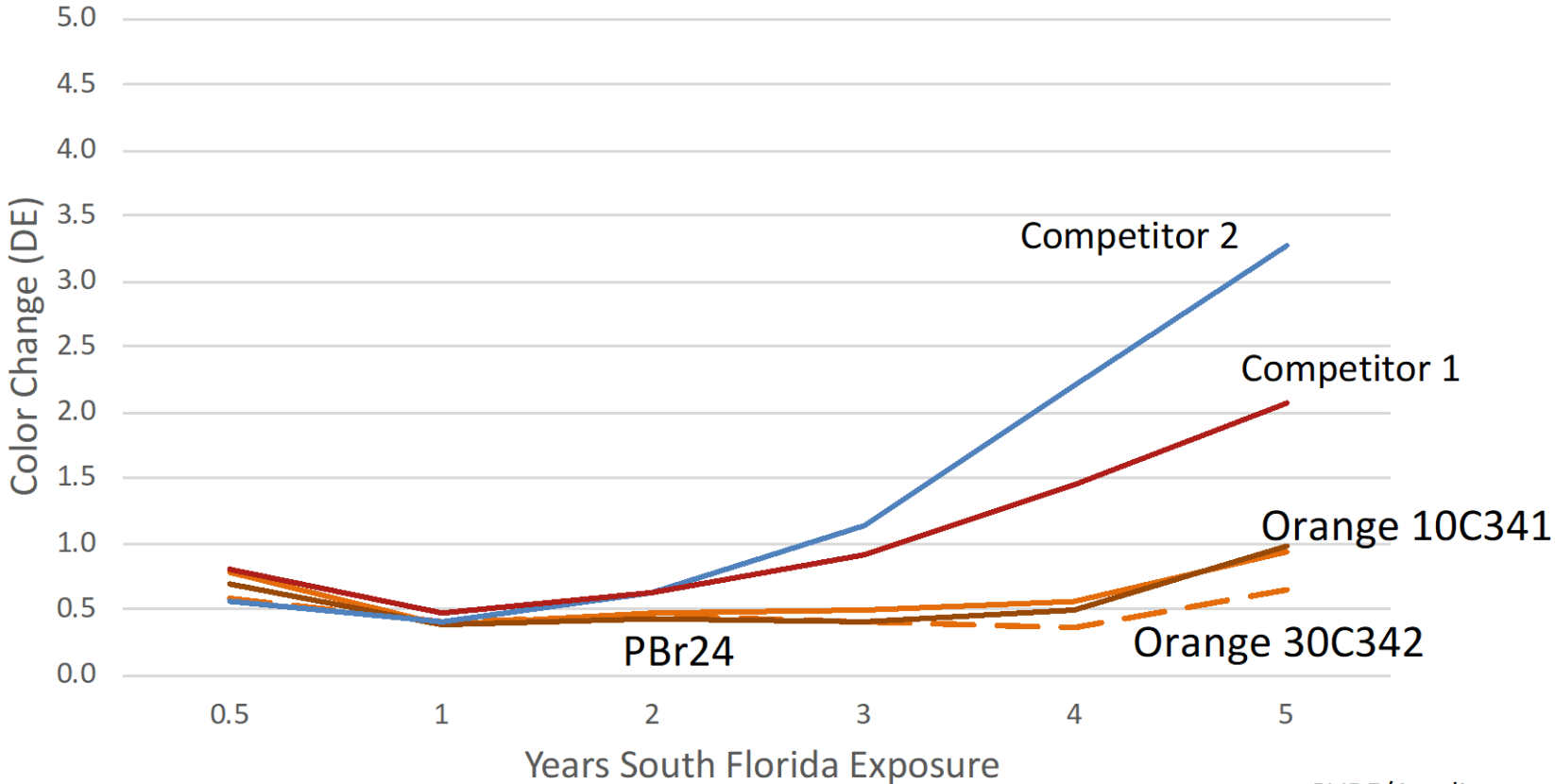
Masstone South Florida Weathering



- PVDF/Acrylic Ma
- Orange 10C3
- Orange 30C3
- Yellow 29
- Cl Pigment YH
- Competitor
- Competitor

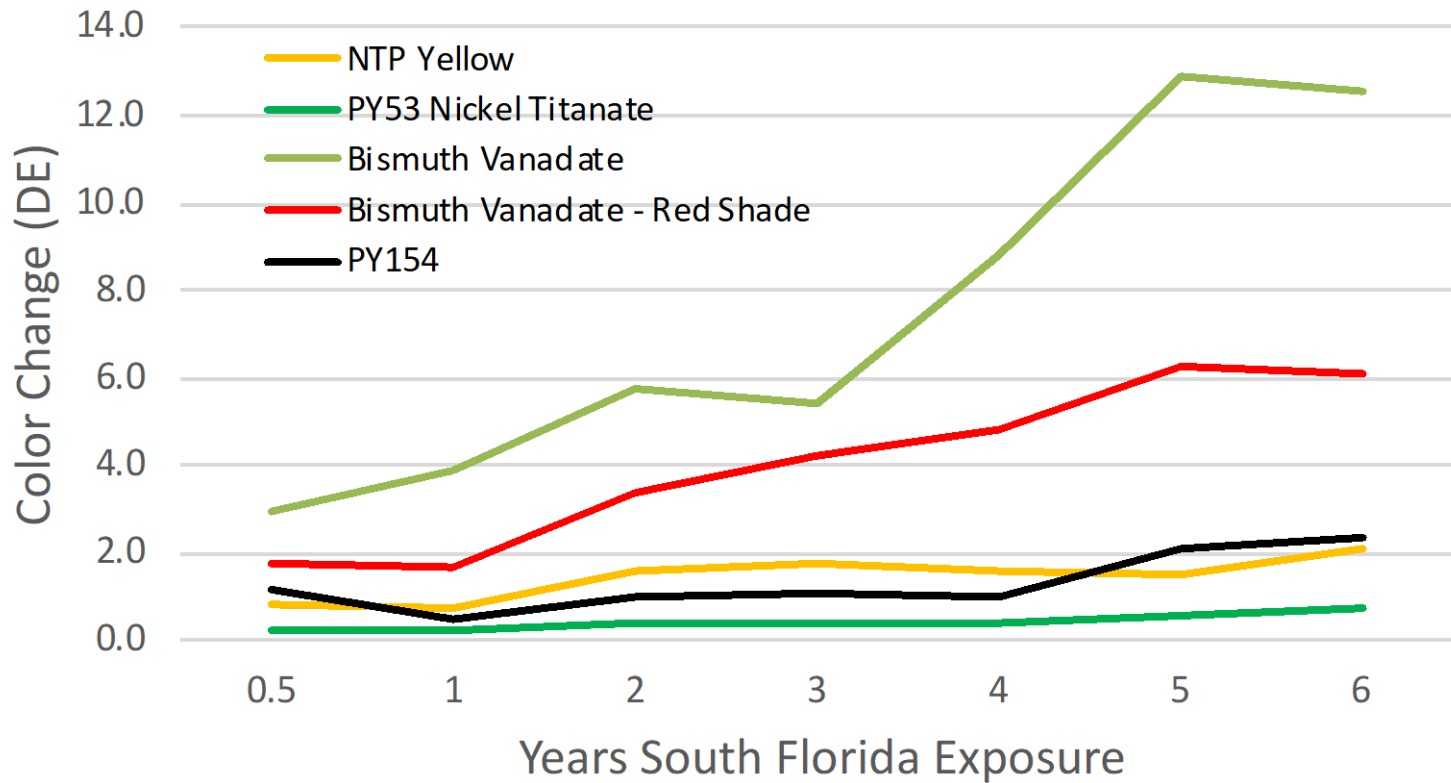
RTZ

4:1 Tint South Florida Weathering



PVDF/Acrylic 4:1
Orange 10C341
Orange 30C342
Yellow 29
CI Pigment Y113
Competitor 2
Competitor 1

Masstone South Florida Weathering

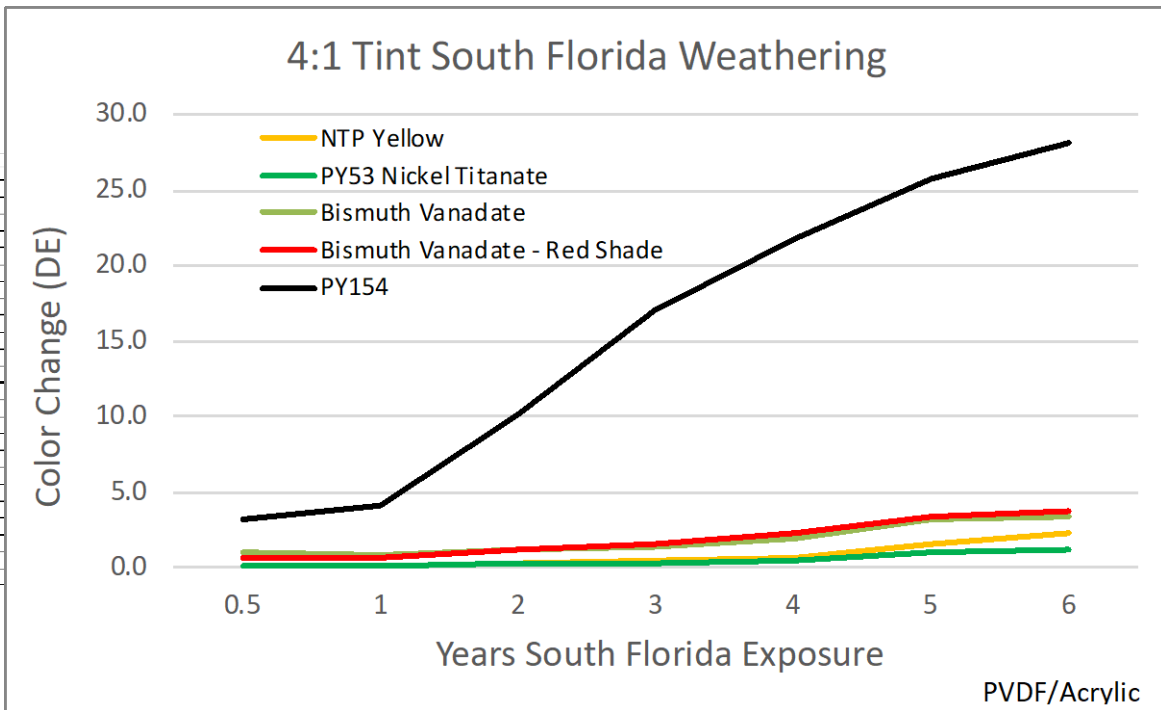


PVDF/Acrylic

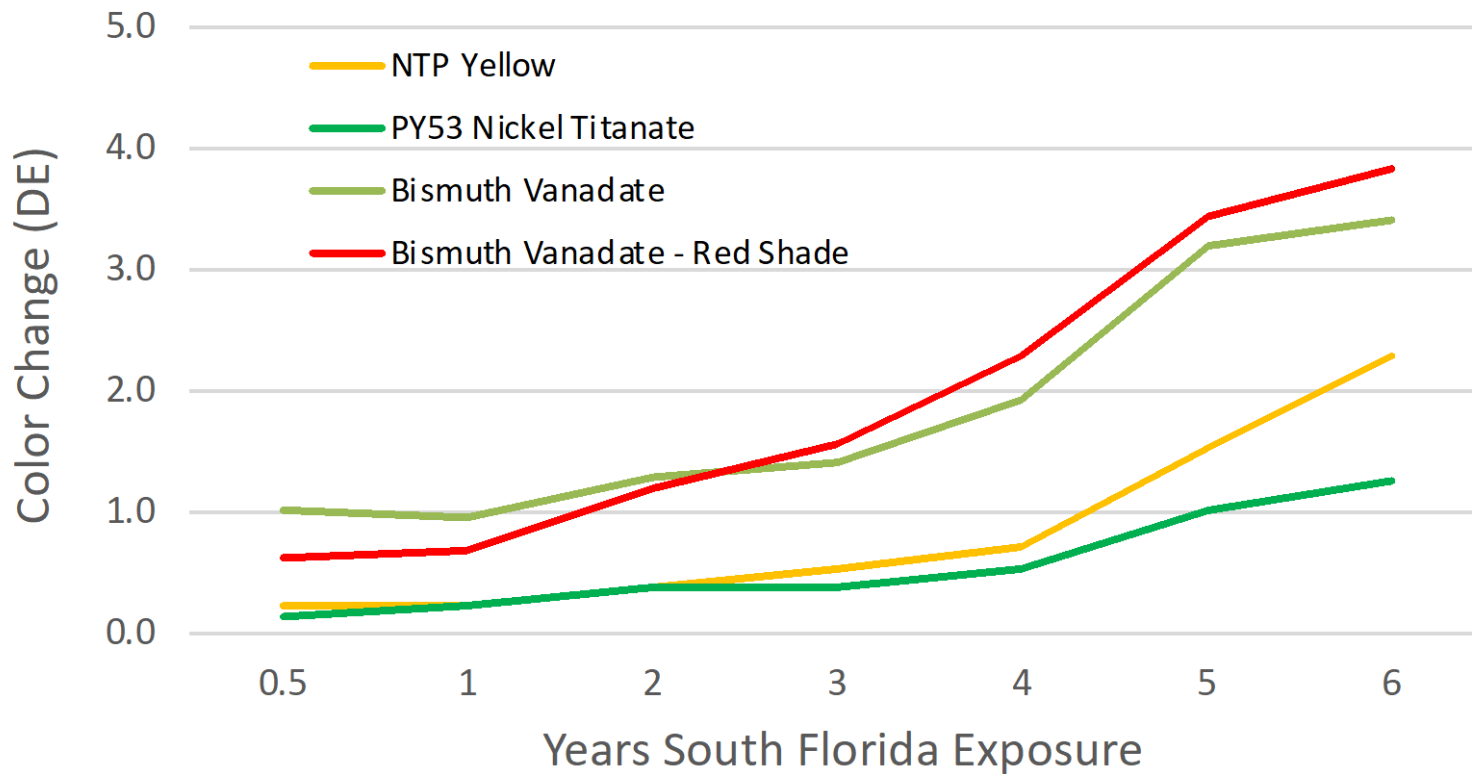


PVDF/Acrylic Masstone	Initial Color Values			Years of Exposure						
				0.5	1	2	3	4	5	6
NTP Yellow	L*	77.6	ΔL^*	0.0	0.0	-0.2	-0.1	-0.2	-0.2	-0.3
	a*	18.9	Δa^*	0.1	0.4	0.5	0.6	0.7	0.5	1.2
	b*	79.4	Δb^*	-0.8	-0.6	-1.5	-1.7	-1.4	-1.4	-1.7
			ΔE^*	0.8	0.7	1.6	1.8	1.6	1.5	2.1
PY53 Nickel Titanate	L*	86.0	ΔL^*	0.0	0.1	0.1	0.2	0.2	0.0	0.1
	a*	-7.6	Δa^*	0.2	0.2	0.3	0.4	0.4	0.5	0.7
	b*	57.1	Δb^*	-0.2	0.1	-0.1	-0.1	0.1	-0.3	-0.1
			ΔE^*	0.3	0.3	0.4	0.4	0.5	0.6	0.7
Yellow 30C119	L*	86.7	ΔL^*	0.0	0.1	0.1	0.1	0.2	0.0	0.2
	a*	-7.4	Δa^*	0.0	0.0	0.1	0.2	0.2	0.3	0.5
	b*	52.7	Δb^*	-0.2	0.0	-0.1	-0.1	0.1	-0.2	0.2
			ΔE^*	0.3	0.3	0.3	0.3	0.3	0.4	0.6
Bismuth Vanadate	L*	87.6	ΔL^*	-0.6	-1.0	-1.8	-1.4	-3.0	-4.9	-4.6
	a*	-8.9	Δa^*	1.9	2.8	3.9	3.7	6.3	8.8	9.2
	b*	86.6	Δb^*	-2.2	-2.6	-3.9	-3.8	-5.3	-8.0	-7.2
			ΔE^*	3.0	3.9	5.8	5.4	8.8	12.9	12.5
Bismuth Vanadate - Red Shade	L*	75.6	ΔL^*	-0.2	-0.3	-0.4	0.1	-0.1	-0.1	0.2
	a*	20.3	Δa^*	-0.1	-0.3	-1.2	-2.3	-2.6	-3.8	-3.8
	b*	72.8	Δb^*	-1.7	-1.7	-3.1	-3.6	-4.1	-5.1	-4.7
			ΔE^*	1.8	1.7	3.4	4.2	4.8	6.3	6.1
PY154	L*	70.6	ΔL^*	-0.3	-0.2	-0.5	-0.6	-0.6	-0.8	-1.0
	a*	-2.4	Δa^*	-0.3	-0.2	-0.2	-0.4	-0.4	-0.7	-0.2
	b*	72.4	Δb^*	-1.1	-0.4	-0.8	-0.9	-0.7	-1.8	-2.2
			ΔE^*	1.2	0.5	1.0	1.1	1.0	2.1	2.4

PVDF/Acrylic 4:1 Tint	Initial Color Values			Years of Exposure						
	L*	a*	b*	0.5	1	2	3	4	5	6
NTP Yellow	L*	77.6	ΔL*	0.2	0.1	0.0	0.0	0.3	0.1	0.2
	a*	18.9	Δa*	0.1	0.2	0.4	0.5	0.6	0.2	0.7
	b*	79.4	Δb*	0.2	0.0	-0.1	-0.2	-0.4	-1.5	-2.2
	ΔE*		0.2	0.3	0.4	0.6	0.7	1.6	2.3	
PY53 Nickel Titanate	L*	86.0	ΔL*	-0.1	0.1	-0.1	0.1	0.2	-0.2	0.3
	a*	-7.6	Δa*	0.1	0.2	0.3	0.3	0.4	0.7	0.8
	b*	57.1	Δb*	0.0	0.0	0.2	0.1	0.3	0.7	-1.0
	ΔE*		0.2	0.2	0.4	0.4	0.6	1.0	1.3	
Yellow 30C119	L*	86.7	ΔL*	-0.1	0.3	0.0	0.1	0.2	0.0	0.3
	a*	-7.4	Δa*	0.1	0.1	0.2	0.2	0.3	0.6	0.6
	b*	52.7	Δb*	0.0	0.0	0.2	0.2	-0.1	-0.5	-0.7
	ΔE*		0.2	0.3	0.3	0.4	0.4	0.8	1.0	
Bismuth Vanadate	L*	87.6	ΔL*	0.4	0.1	-0.2	-0.2	0.2	0.4	-0.2
	a*	-8.9	Δa*	0.6	0.7	1.0	1.0	1.3	1.9	2.0
	b*	86.6	Δb*	0.7	0.6	-0.6	-1.0	-1.4	-2.6	-2.8
	ΔE*		1.0	1.0	1.3	1.4	1.9	3.2	3.4	
Bismuth Vanadate - Red Shade	L*	75.6	ΔL*	-0.3	0.1	-0.1	0.0	0.2	0.1	0.4
	a*	20.3	Δa*	0.1	0.1	-0.3	-0.4	-0.6	-0.7	-0.5
	b*	72.8	Δb*	0.6	0.7	1.2	-1.5	-2.2	-3.4	-3.8
	ΔE*		0.6	0.7	1.2	1.6	2.3	3.5	3.9	
PY154	L*	70.6	ΔL*	-0.1	0.3	0.6	1.1	1.4	1.5	1.9
	a*	-2.4	Δa*	0.3	0.3	0.5	1.1	1.5	1.8	2.2
	b*	72.4	Δb*	-3.3	-4.1	-10.1	-17.0	-21.7	-25.7	-28.0
	ΔE*		3.3	4.1	10.1	17.1	21.8	25.8	28.1	



4:1 Tint South Florida Weathering



PVDF/Acrylic

PURE
CONVENIENCE

PURE
CONSISTENCY

PURE
PROFITABILITY



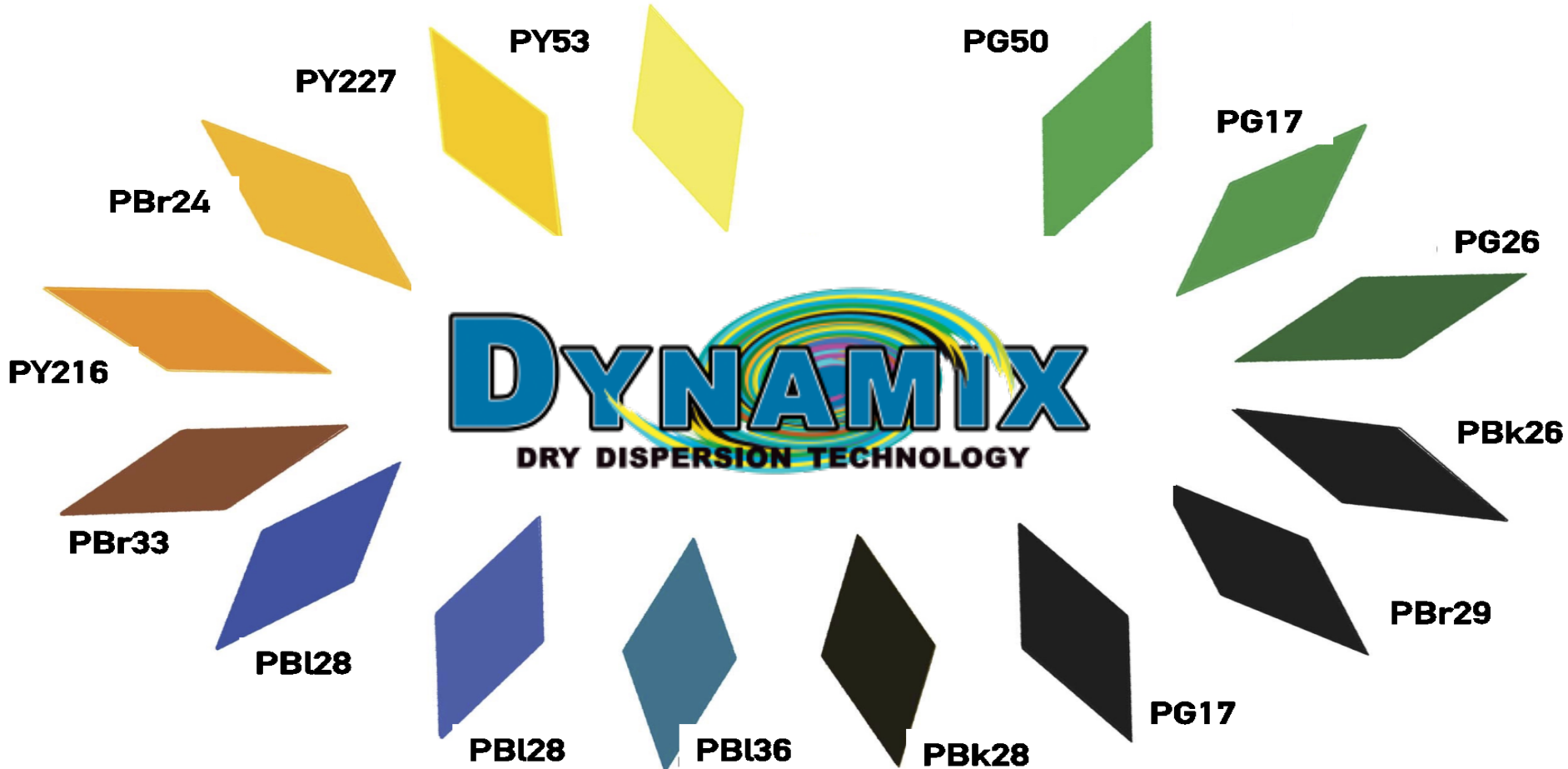
CUT OUT THESE STEPS

A 3D cutaway diagram of a mixing process. It shows a central mixing machine with two rollers. To its left is a cylindrical tank with a blue liquid inside. To its right is another cylindrical tank with a blue liquid inside. A grey pipe connects the left tank to the machine, and another pipe connects the machine to the right tank. A third pipe leads from the right tank to a fourth cylindrical tank at the bottom right, which also contains blue liquid. The entire setup is shown in a perspective view, with the pipes and tanks appearing to be cut away to reveal the internal components and the flow of material.

JUST
STIR
IT IN

AND GO
STRAIGHT
TO THE TANK

COMPLETE COLOR PALETTE





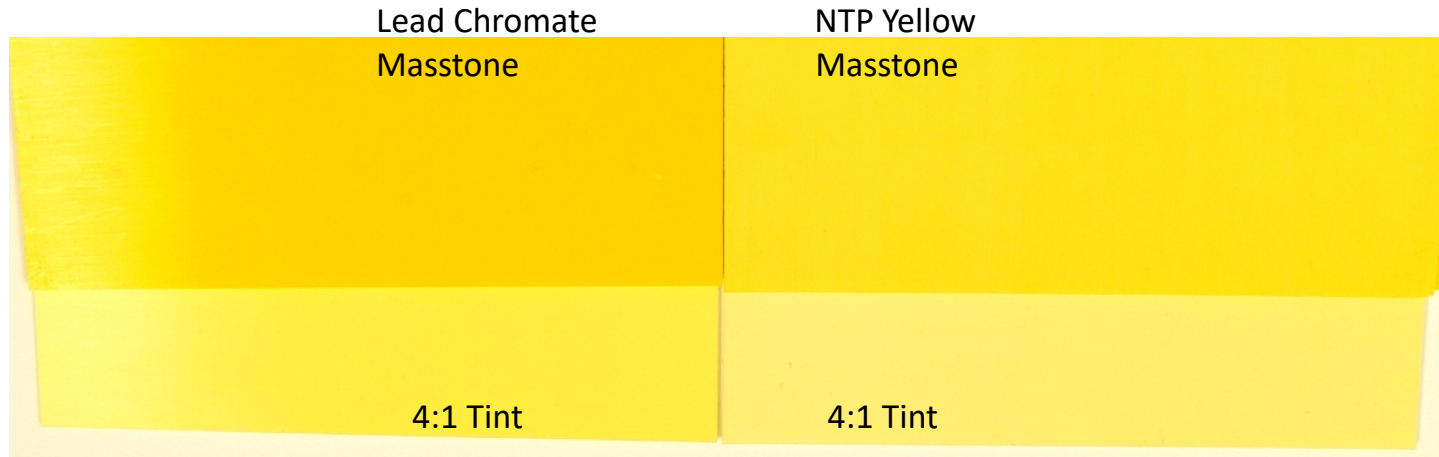
The Shepherd Color Company
We Brighten Lives

IT'S **ALL** IN
THE BOX...



Versus Lead Chromate

- Similar Chroma and shade
- No silica shell to shear off
- No acid instability
- Advantages in regulatory area



Versus Bismuth Vanadate

- Not a direct competitor
- Higher opacity
- Greater heat stability
- Higher tint strength
- Greater acid/alkali resistance
- No shear sensitive silica shell

PY 184 (GS)
Masstone

NTP Yellow
Masstone

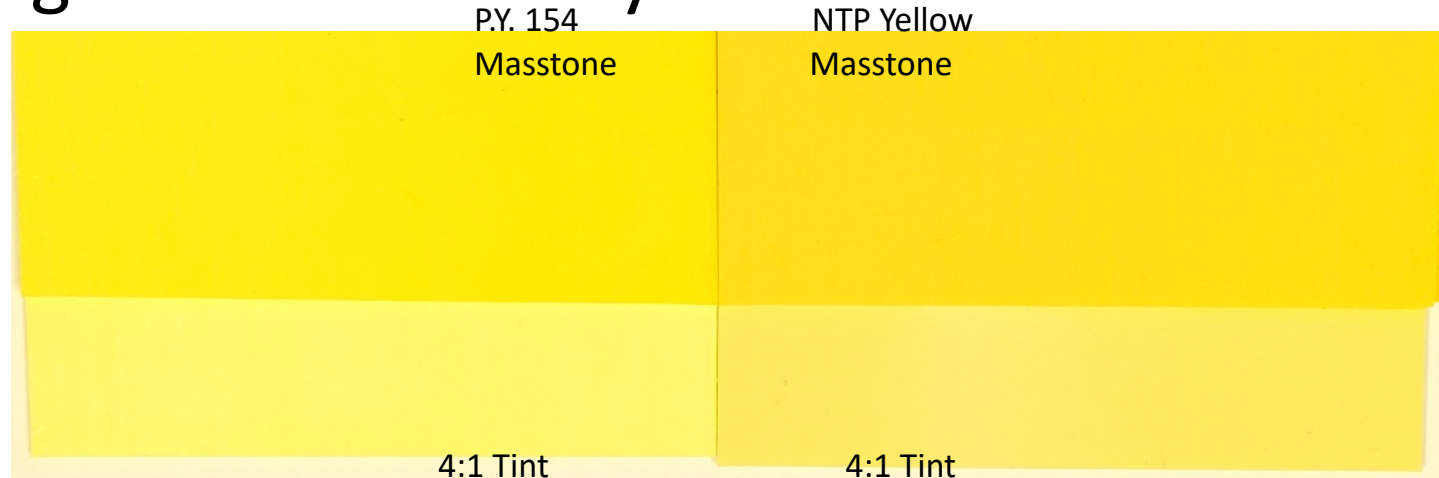
PY 184 (RS)
Masstone



4:1 Tint s

Versus organics

- Better stability in tints with white
- Higher opacity
- Higher heat stability



Physical Properties

Physical/Chemical Property	NTP Yellow (Typical Value)	RTZ Orange (Typical Value)	Units	Test Method+
Specific Gravity	5.5	4.5	n/a	SCTM 312
Loose Packing Density	6.7 0.80	6.7 0.80	lbs./gal kg/L	SCTM 194
Surface Area (BET)	3.5	7.3	m ² /g	SCTM 153
Percent Moisture	0.1	0.6	wt. %	SCTM 248
Mean Particle Size	0.9	1.3	microns	SCTM 183
Conductivity	14	110	μS/cm	SCTM 142
Oil Absorption	11	19	parts oil/100 parts pigment	SCTM134
pH	5.4	4.9	n/a	SCTM 101
Residue 325 Mesh	0.01	0.02	wt. %	SCTM 135
Heat Stability	600 320	600 320	°F °C	Observed

+SCTM refers to Shepherd Color Testing Method

Registrations

	NTP Yellow	RTZ Orange
USA TSCA	•	•
EU REACH	•	•
China	•	In process
Canada NDSL	•	•
Korea	•	•
Australia	•	•
Taiwan	•	•
New Zealand	•	•
Japan	•	•

Please contact us for specific and latest updates.

Regulatory Approvals

Color	AP(89)1	AS 2070-1999	EN71.3: 2013 (Category I)	EN71.3: 2013 (Category II)	EN71.3: 2013 (Category III)	CONEG & 94/62/EC	RoHS/ELV/W EEE	FDA	French Positive List	TCLPs	BfR	JHOSPA	HPB	SONY List	GB9685-2008	GB9685-2016	REACH Compliant
C.I. Pigment Yellow 216																	
Orange 10C341	✓	✓	1%	-	10%	✓	✓	-	-	✓	✓	-	-	✓	-	-	✓
Orange 10P340	✓	✓	1%	-	10%	✓	✓	-	-	✓	✓	-	-	✓	-	-	✓
Orange 30C342	✓	✓	1%	-	10%	✓	✓	-	-	✓	✓	-	-	✓	-	-	✓
C.I. Pigment Yellow 227																	
Yellow 10C151	✓	✓	1%	-	10%	✓	✓	-	-	✓	✓	-	-	✓	-	-	✓
Yellow 10P150	✓	✓	1%	-	10%	✓	✓	-	-	✓	✓	-	-	✓	-	-	✓
Yellow 30C152	✓	✓	1%	-	10%	✓	✓	-	-	✓	✓	-	-	✓	-	-	✓

Please contact us for specific and latest updates.

New and Improved

NTP Yellow 30C152

CI Pigment Yellow 227

(Niobium Tin Pyrochlore)

- New patented chemistry
- Bright red-shade yellow
- High-opacity
- High-chromaticity
- Extremely inert
- High-temperature stable



RTZ Orange 30C342

CI Pigment Yellow 216

(Rutile Tin Zinc)

- Improved color space
- High opacity
- Excellent red tone
- Engineered for inertness
- Color synergist
- High-temperature stable

Chromaticity

Opacity

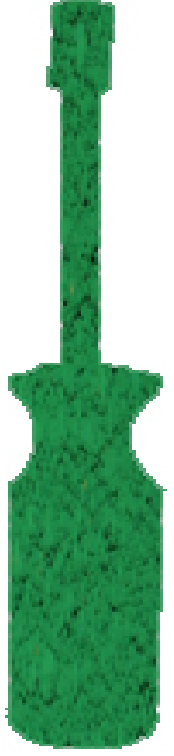
Durability

Highly Engineered Pigments

- High performance systems
- Corporate colors
- Automotive
- ACE
- Transportation
- High durability thin films
- Signage applications
- Silicate Coatings



uHPP





The Shepherd Color Company

We Brighten Lives

Thank you! - Questions?

Mark Ryan



MORE
EXPERTISE



BETTER
PERFORMANCE



BEST
VALUE



3D Color Chart Website & App!!!

