

Pozzsource Functional Extenders



Pozzsource Functional Extenders (PFE) Introduction

- Pozzsource Industrial applications of fine powdered volcanic ash (SiO₂)
 - First applications focused on the Concrete Industry
 - Products make concrete better, greener and less expensive
 - Currently offering PFE to the Coatings Industry
 - PFE are competitive as
 - Pozzsource Hide - TiO₂ replacement
 - Pozzsource Tuff - Abrasion and scuff resistance
 - Pozzsource Silicate - Economic extender
- Pozzsource Background
 - Pozzsource develops products and technology for industrial applications
 - Founded in 2015
 - Specialized material sources include naturally occurring volcanic ash
 - Developed mineral sources in California and Utah
 - Built processing facility near Salt Lake City, Utah in 2021

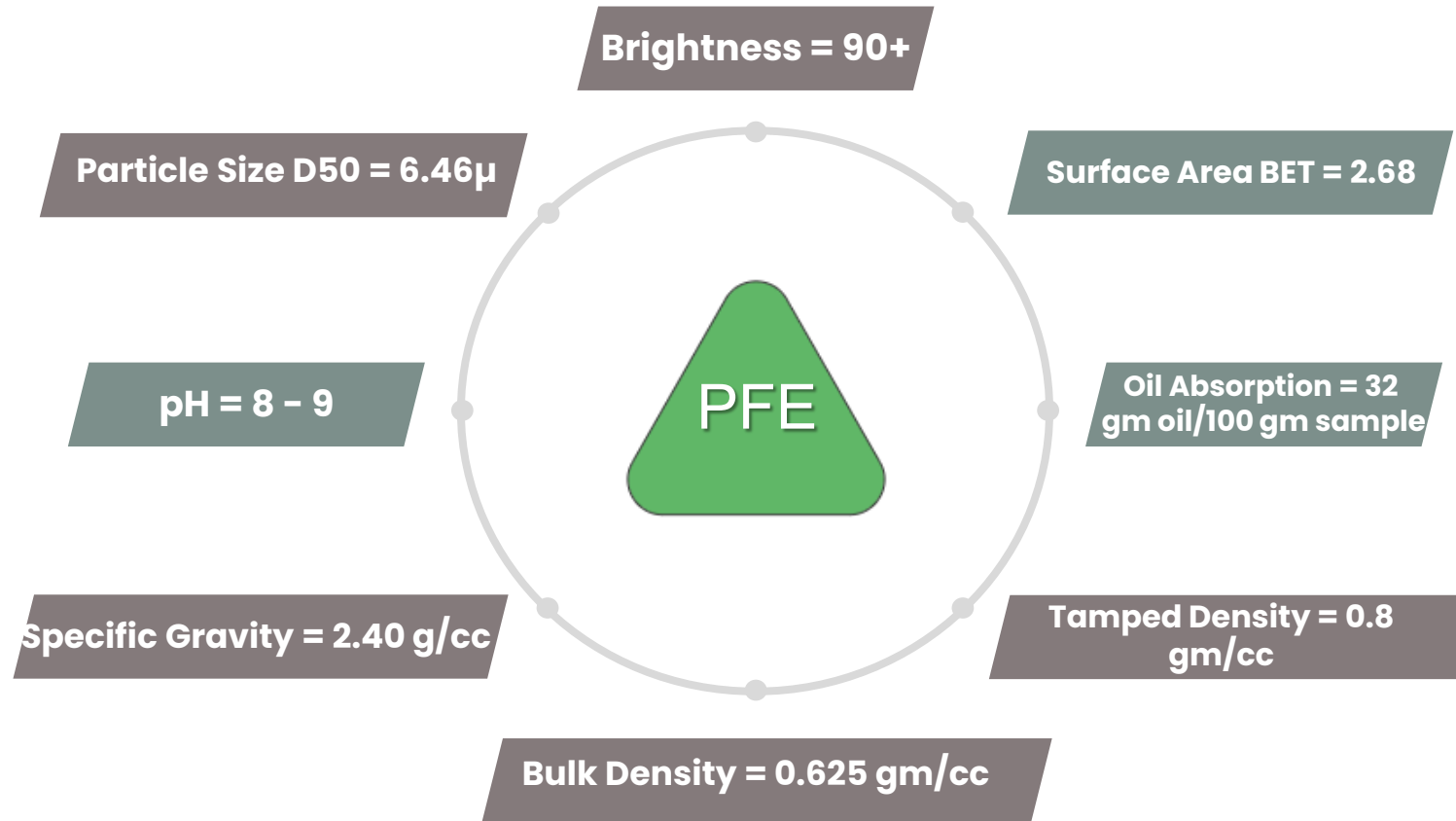
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Coatings Market Segments

- Pozzsource Functional Extenders will provide value in several coatings areas
 - Pozzsource Hide - **Optical - TiO₂ replacement**
 - Replaces up to 60% of TiO₂ (by volume)
 - Titanium Oxide is one of the most expensive inorganic pigments, replacement ultimately saves money, making the final product more economical
 - Pozzsource Tuff - **Abrasion and scuff resistance** components
 - Geologic mineral is literally “tuff”
 - Toughness as proven coatings compound improves performance
 - Pozzsource Silicate - **Functional Extender**
 - Provides excellent strength to the existing paint formulations.
 - Improves the dry film characteristics while having no adverse effects on existing properties

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PHYSIOCHEMICAL PROPERTIES



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Benefits of Using Pozzsource Functional Extenders

➤ Wet Properties

- No adverse effect on the wet properties such as:
 - Viscosity (low, medium & high shear)
 - pH
 - Sag resistance
 - Heat Aged stability

➤ Optical Properties

- Up to 60% Replacement of TiO₂ (Volume basis) has no adverse impact on Hiding Power / Opacity of the finished paint

➤ Dry Film Properties

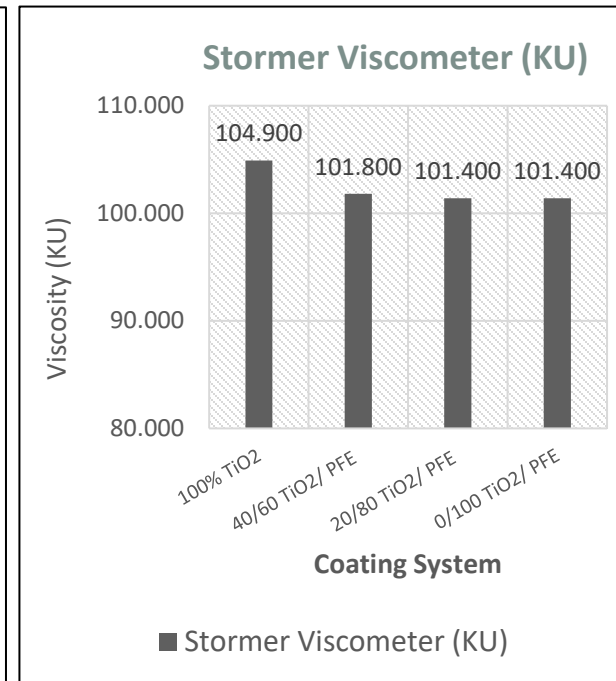
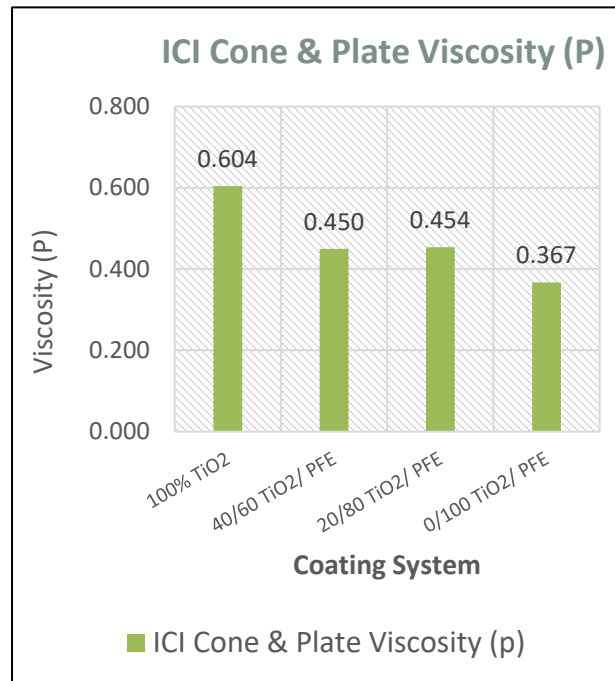
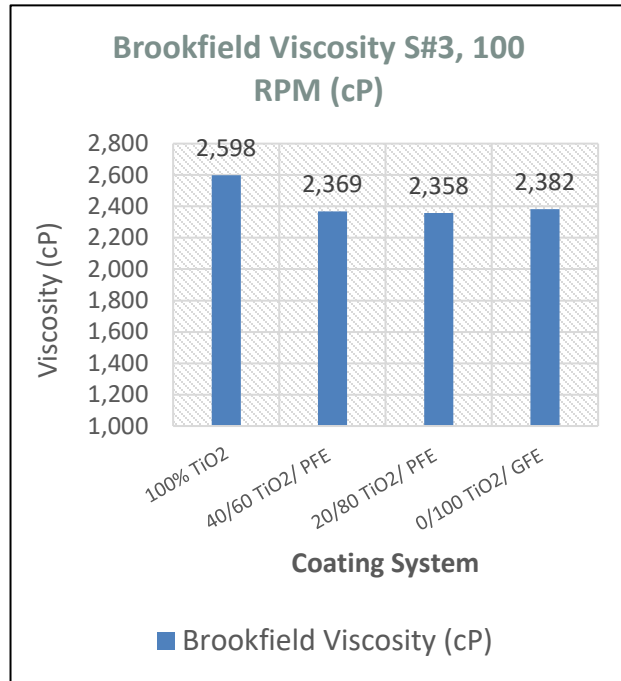
- Improvement in physical, chemical and mechanical properties include
 - Taber Abrasion
 - Wet Scrub Resistance
 - Dry Scrub / Burnish Resistance
 - Spot Resistance – House Hold Chemicals

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Wet Properties

- Viscosity – Low Shear , Medium Shear And High Shear
 - Incorporation of PFE into an existing paint formulation has no significant changes on the viscosity of the finished paint
 - Tests performed with 60%, 80% and 100% TiO2 replacement with PFE **Pozzsource Hide Product**



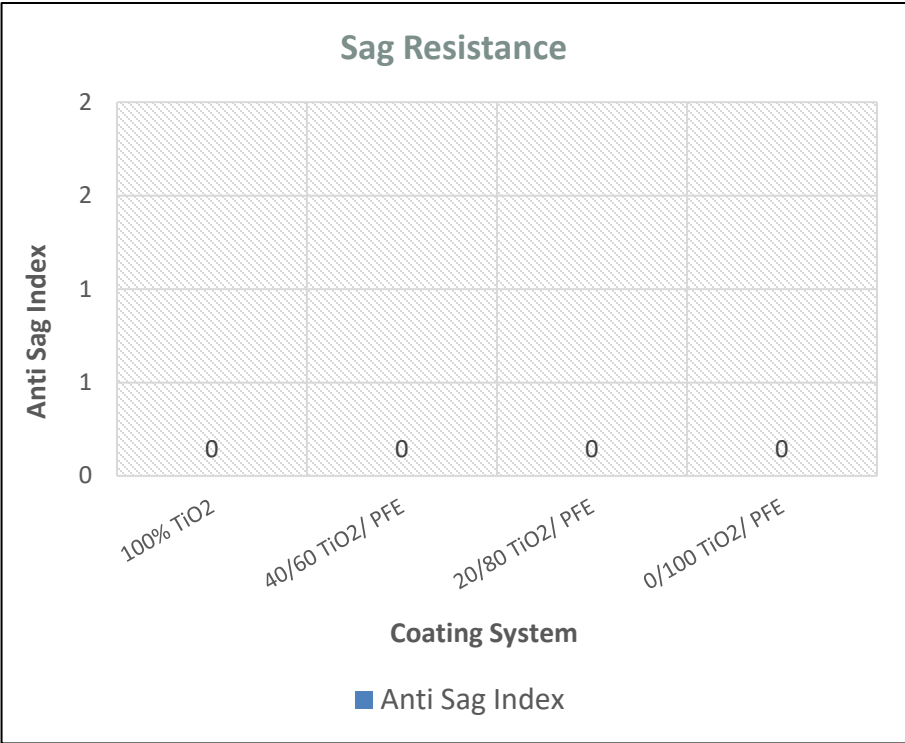
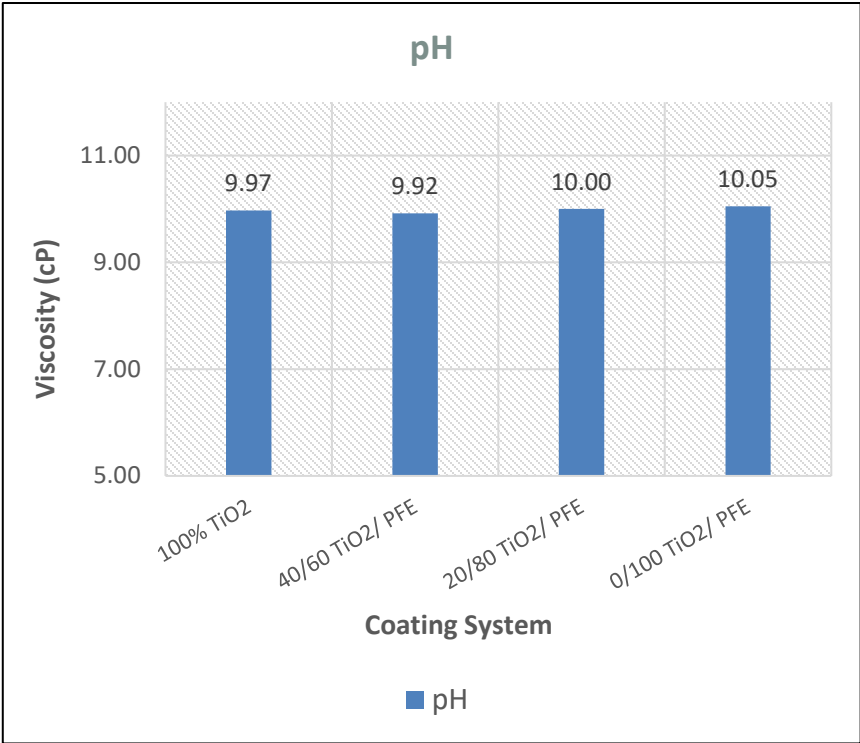
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Wet Properties

➤ pH & Sag Resistance

- Incorporation of PFE into an existing paint formulation has no significant changes on the pH or the sag resistance of the final product.
- Tests performed with 60%, 80% and 100% TiO2 replacement with PFE **Pozzsource Hide** Product



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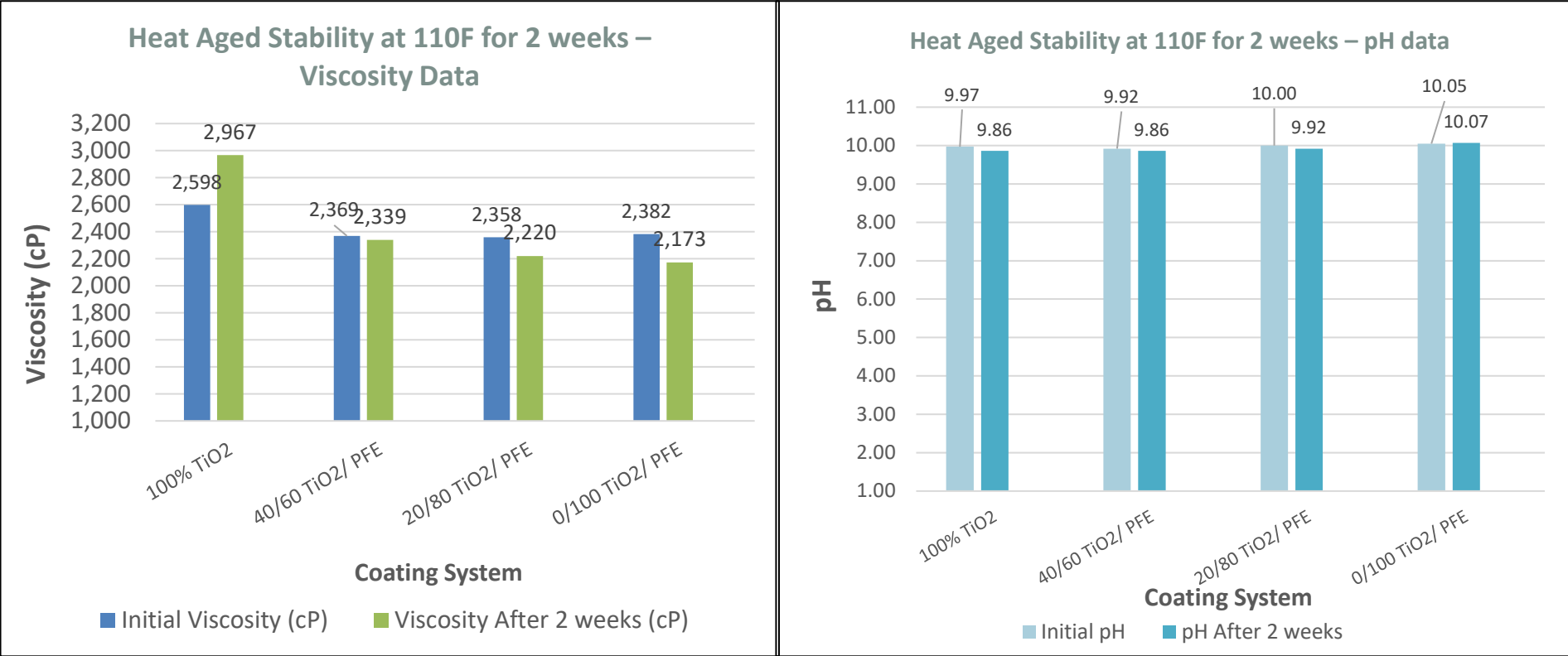
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Wet Properties

➤ HEAT AGED STABILITY

- PFE formulation shows good heat aged stability at 110° F over 2 weeks with no phase separation, pigment flooding, or floating, syneresis
- All the variations showed soft settling were easily re-dispersible
- Tests performed with 60%, 80% and 100% TiO2 replacement with PFE **Pozzsource Hide Product**



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Optical Properties

- Titanium dioxide (TiO_2) is the par excellence in the industry and the world's best-selling inorganic pigment. However, titanium is a product whose high price is subject to large variations due to product availability.
- These price increases affect the competitiveness of finished products, so the search for an alternative to titanium dioxide has generated a variety of possibilities to optimize its use.
- PFE's excellent optical properties provide both technical and economic advantages in the substitution of TiO_2 , which includes up to 60% replacement of TiO_2 for non-optimized formulations on weight basis.

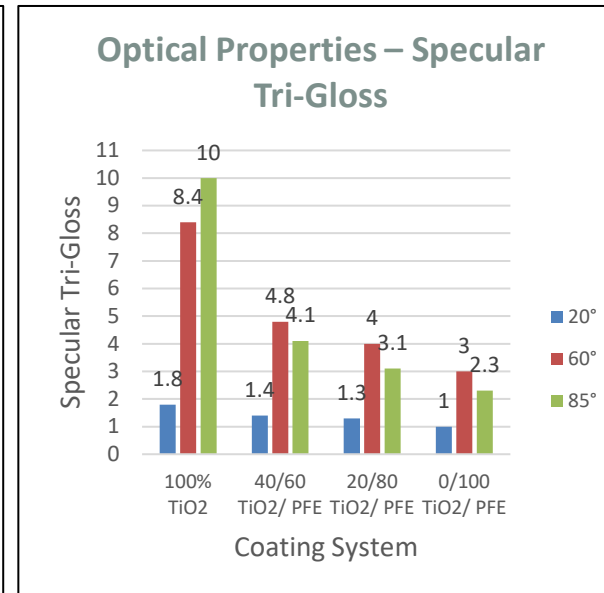
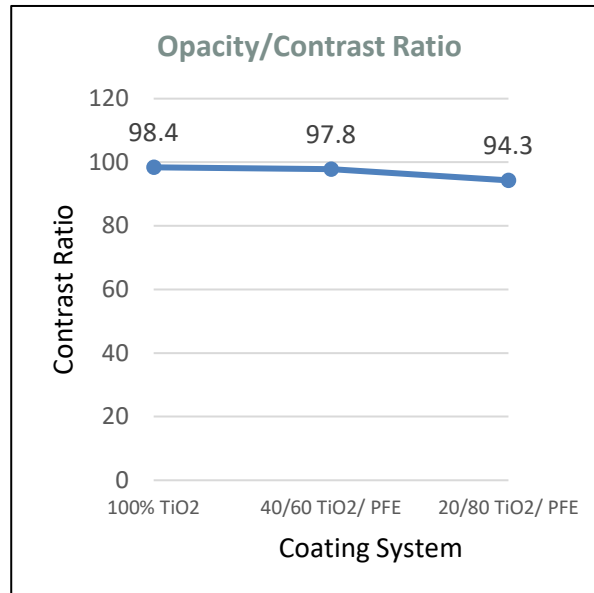
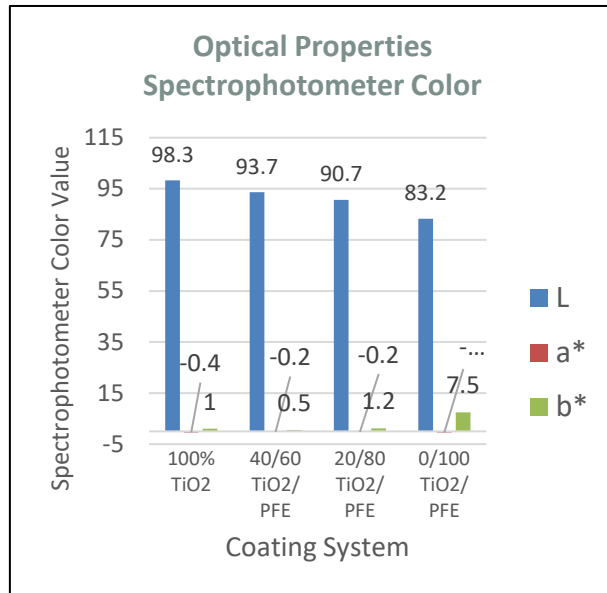


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Optical Properties

- Opacity, Spectrophotometer Color, Specular Gloss
 - Formulation containing 60% PFE have similar Opacity/Hiding and color characteristics of the formulation containing 100% TiO₂



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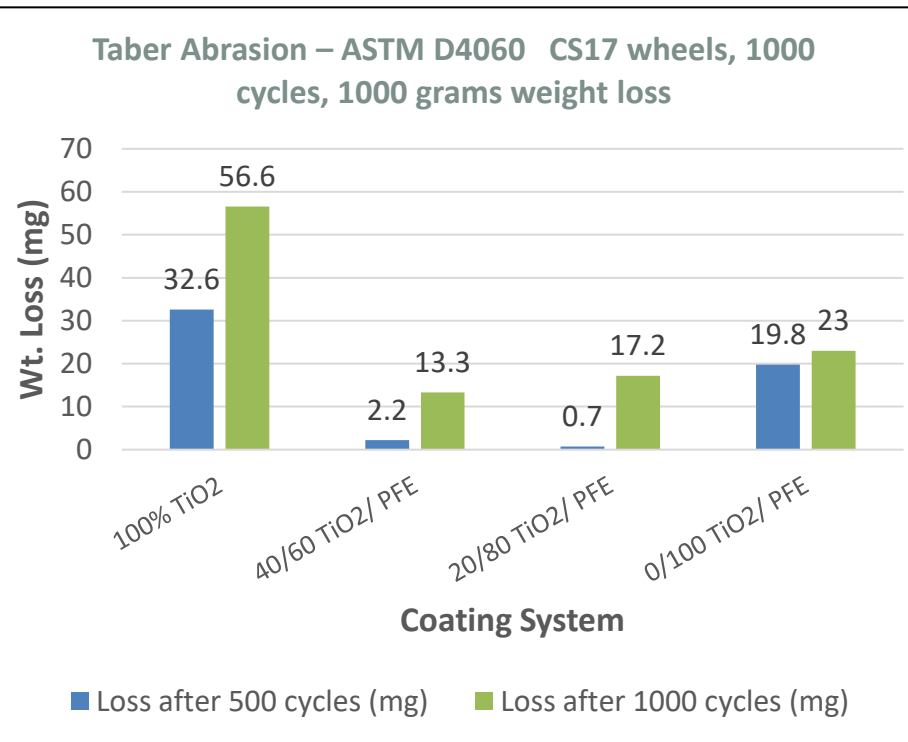
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Dry Film Properties

➤ Improved Taber Abrasion

- Formulation containing PFE have significant improvement in the Taber abrasion and lower weight loss after 1,000 cycles, compared to those containing TiO₂.

Formulations	Panel initial wt. (g)	Panel wt. after 500 cycles (g)	Panel wt. after 1000 cycles (g)	wt. loss after 500 cycles (mg)	loss after 1000 cycles (mg)
100% TiO ₂	72.6671	72.6345	72.6105	32.6	56.6
40/60 TiO ₂ / PFE	72.1887	72.1865	72.1754	2.2	13.3
20/80 TiO ₂ / PFE	72.0662	72.0655	72.049	0.7	17.2
0/100 TiO ₂ / PFE	68.33	68.3102	68.307	19.8	23
40/60 TiO ₂ /nepheline syenite	70.3546	70.3525	70.3391	2.1	15.5
20/80 TiO ₂ /nepheline syenite	65.8104	65.8071	65.7958	3.3	14.6
0/100 TiO ₂ /nepheline syenite	69.9737	69.9699	69.9627	3.8	11

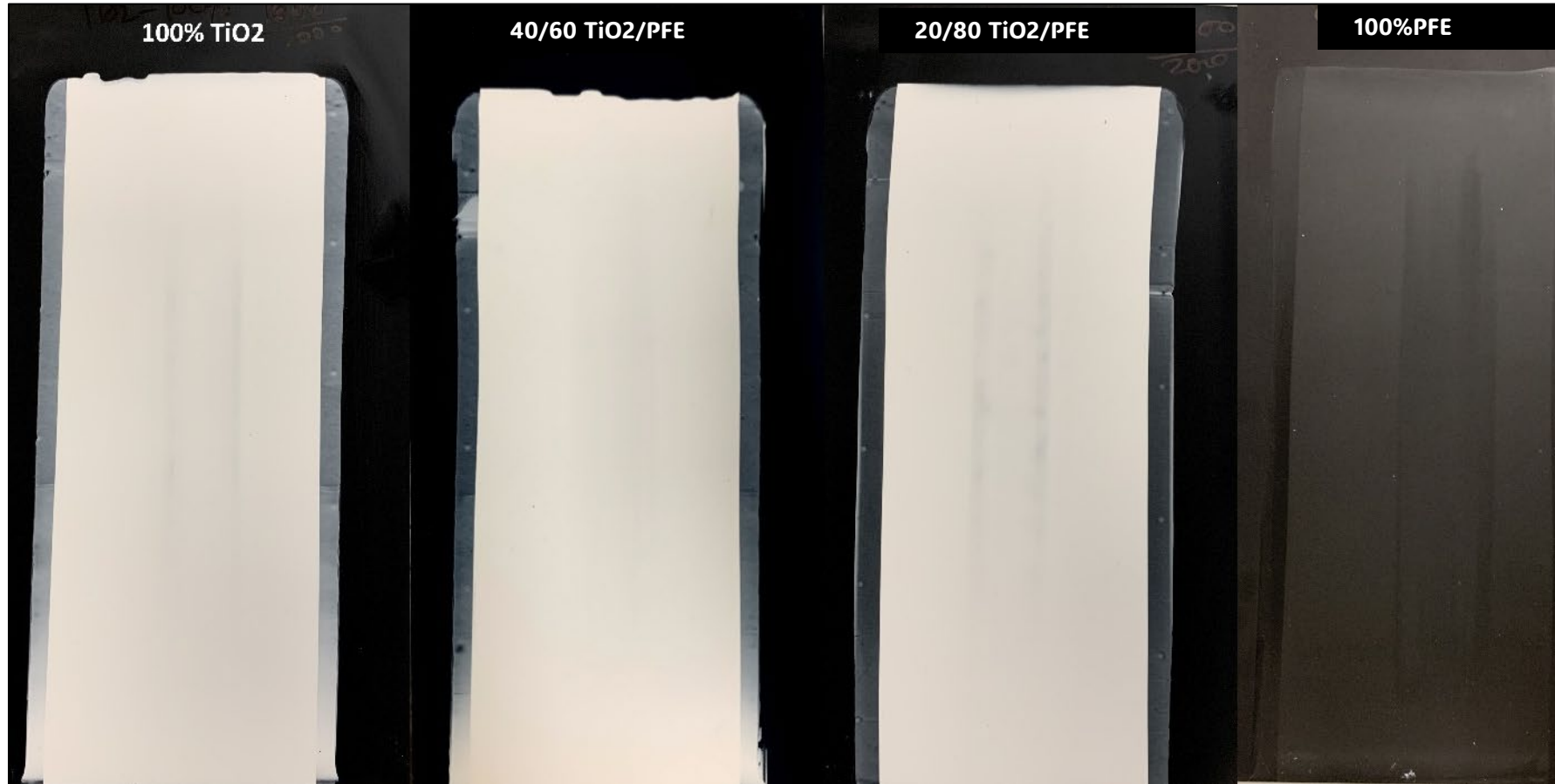


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Dry Film Properties

- Wet Scrub Resistance - TiO₂ vs PFE formulation
 - 40/60 ratio of TiO₂/PFE has better wet scrub resistance compared to variation with 100% TiO₂

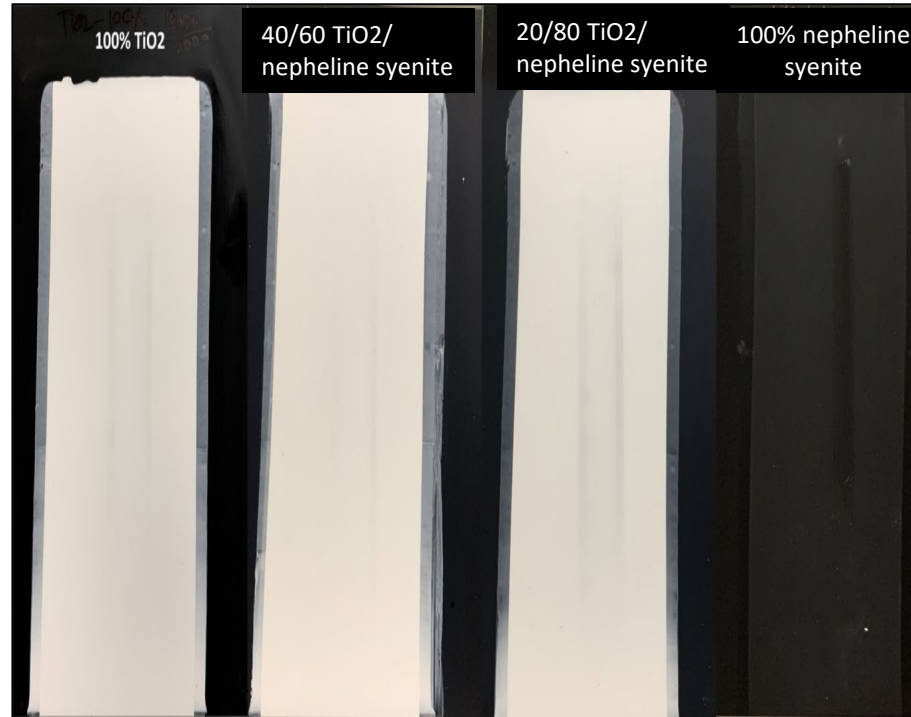
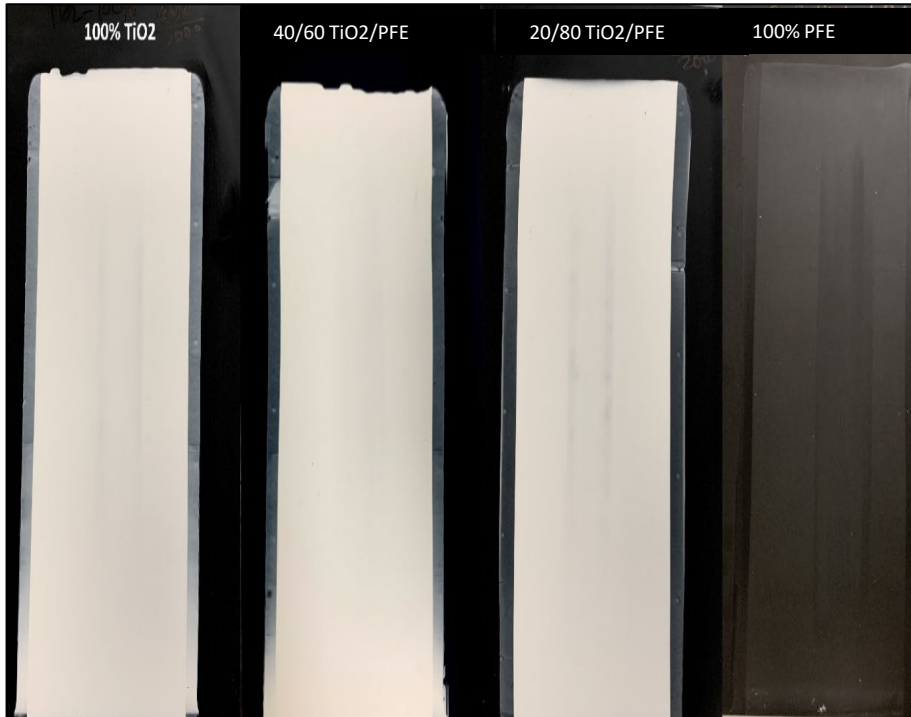


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Dry Film Properties

- Wet Scrub Resistance - TiO₂ vs PFE vs nepheline syenite
 - 40/60 ratio of TiO₂/PFE has better wet scrub resistance compared to variations containing 100% TiO₂ and nepheline syenite.



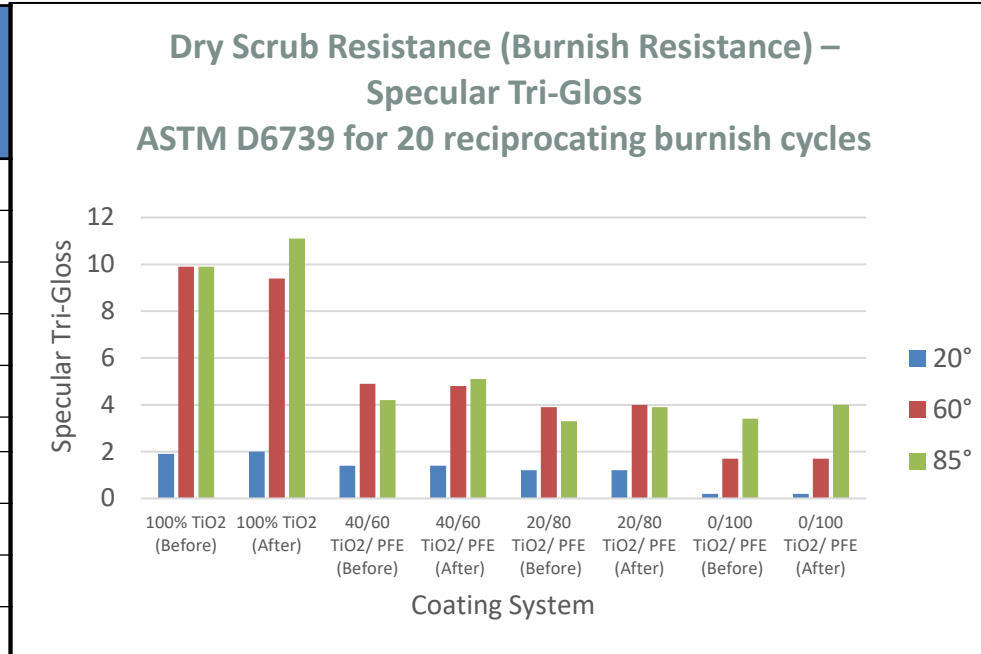
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Dry Film Properties

- Dry Scrub // Burnish Resistance – Specular Tri Gloss
 - 100 TiO₂, 40/60 and 20/80 ratio of TiO₂/PFE has better burnish resistance compared to 40/60 and 20/80 ratio of TiO₂/ nepheline syenite

Formulations	Dry Film Thickness (Mil)	Initial Tri-Gloss			Tri-Gloss (After burnish resistance test)			85° % gloss change
		20°	60°	85°	20°	60°	85°	
TiO₂/PFE								
100/0	2	1.9	9.9	9.9	2	9.4	11.1	12.12
40/60		1.4	4.9	4.2	1.4	4.8	5.1	21.43
20/80		1.2	3.9	3.3	1.2	4	3.9	18.18
0/100		0.2	1.7	3.4	0.2	1.7	4	17.65
TiO₂/nepheline syenite								
40/60	2	1.5	4.7	4.3	1.5	4.8	5.3	23.26
20/80		1.3	3.9	4.6	1.3	4.1	5.7	23.91
0/100		0.2	1.7	3.2	0.2	1.7	3.7	15.63



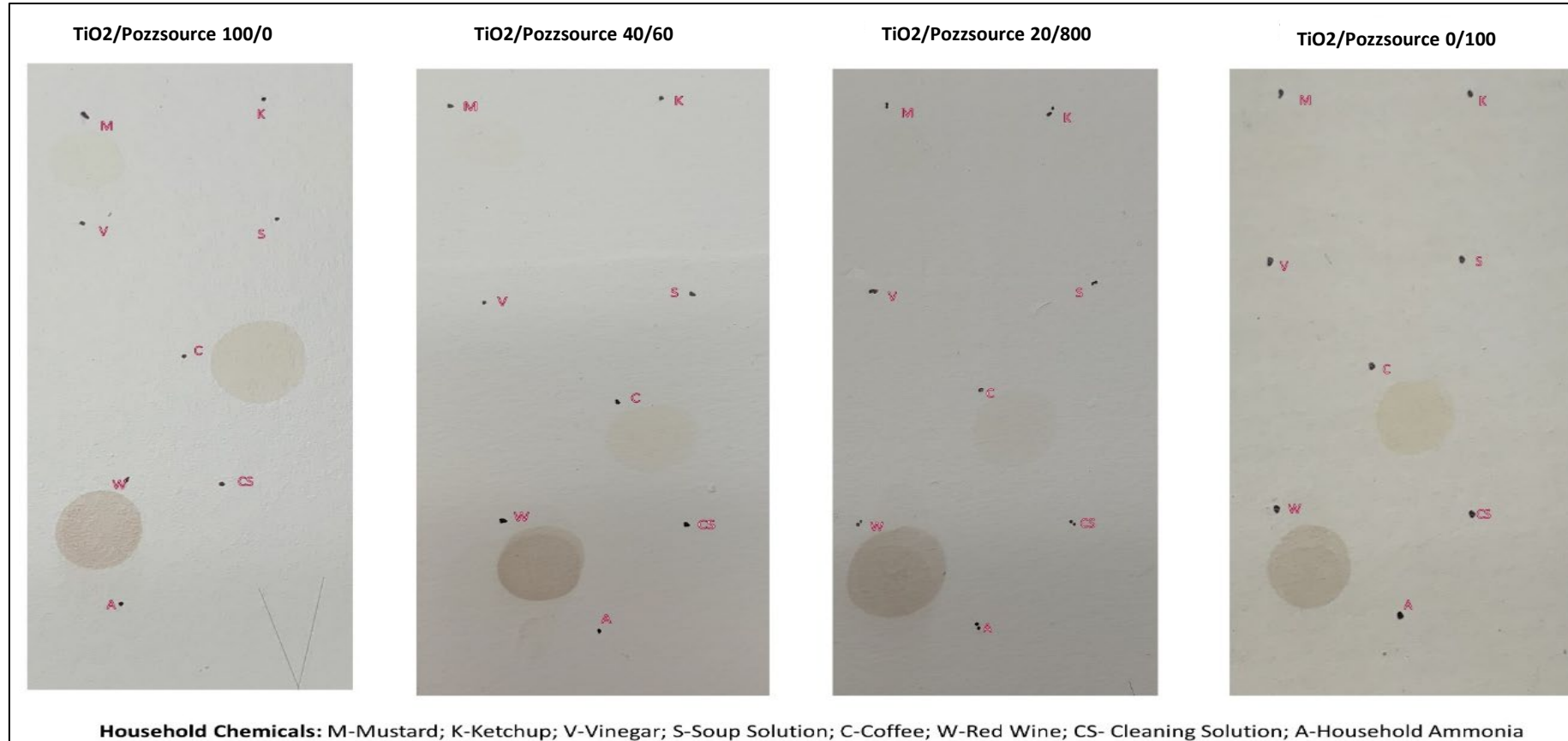
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Dry Film Properties

➤ Stain Resistance – Household Chemicals

- There's no adverse effect on resistance to household chemicals or spot test that is visible for PFE vs that of TiO₂.

15 Minutes



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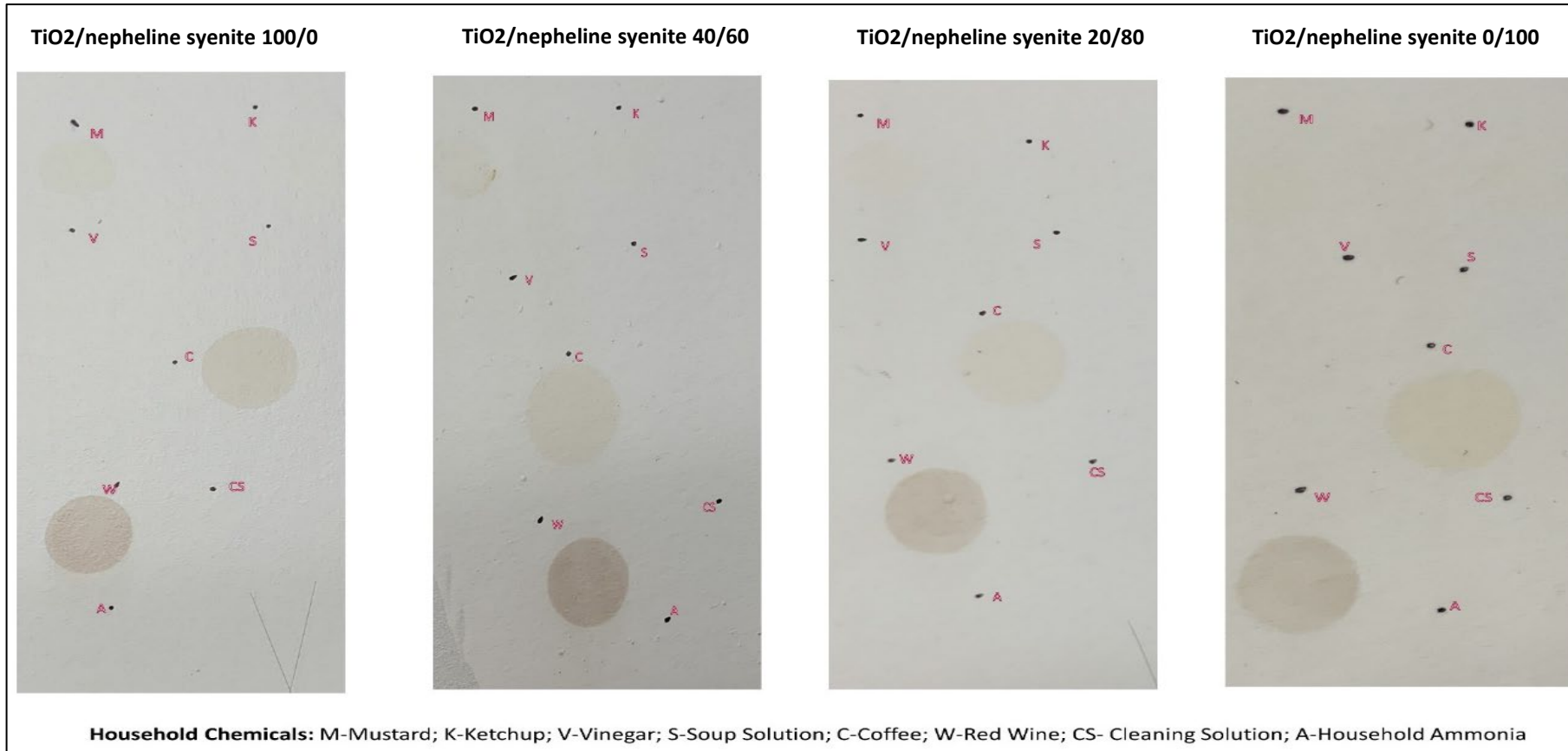
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Dry Film Properties

➤ Stain Resistance – Household Chemicals

- There's no adverse effect on resistance to household chemicals or spot test that is visible for PFE vs that of nepheline syenite formulation.

15 Minutes



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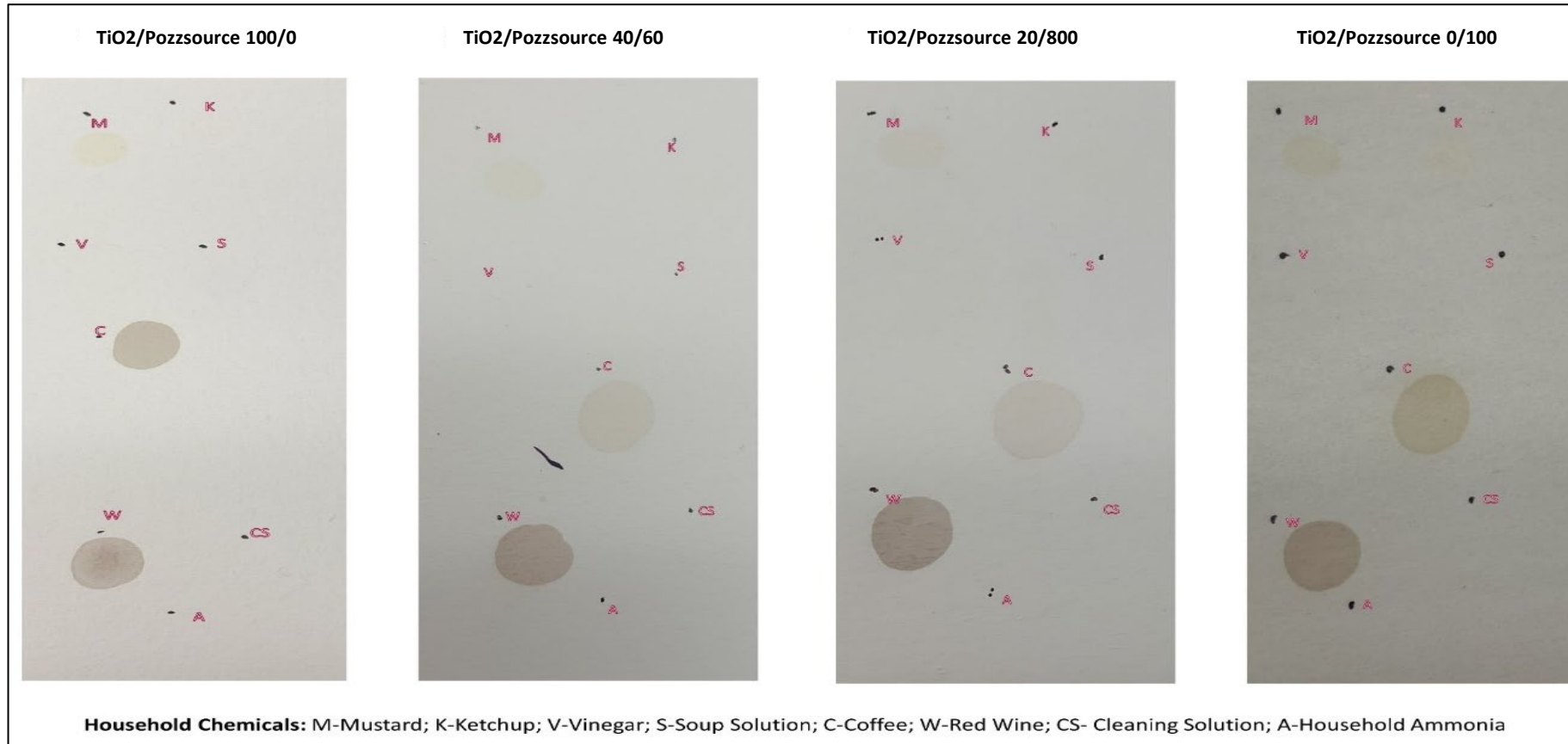
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Dry Film Properties

➤ Stain Resistance – Household Chemicals

- There's no adverse effect on resistance to household chemicals or spot test that is visible for PFE vs that of TiO₂.

60 Minutes



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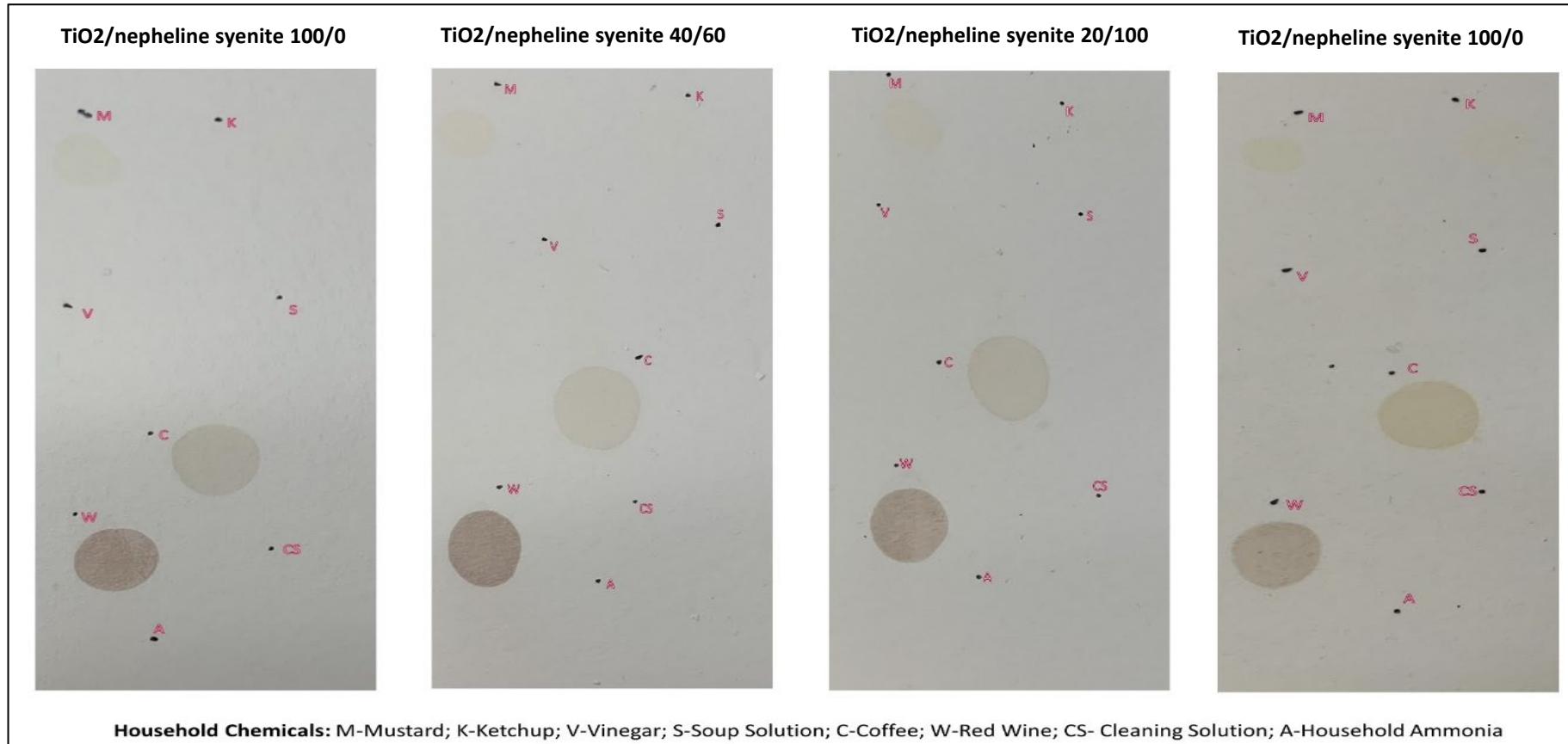
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Dry Film Properties

➤ Stain Resistance – Household Chemicals

- There's no adverse effect on resistance to household chemicals or spot test that is visible for PFE vs that of nepheline syenite formulation.

60 Minutes



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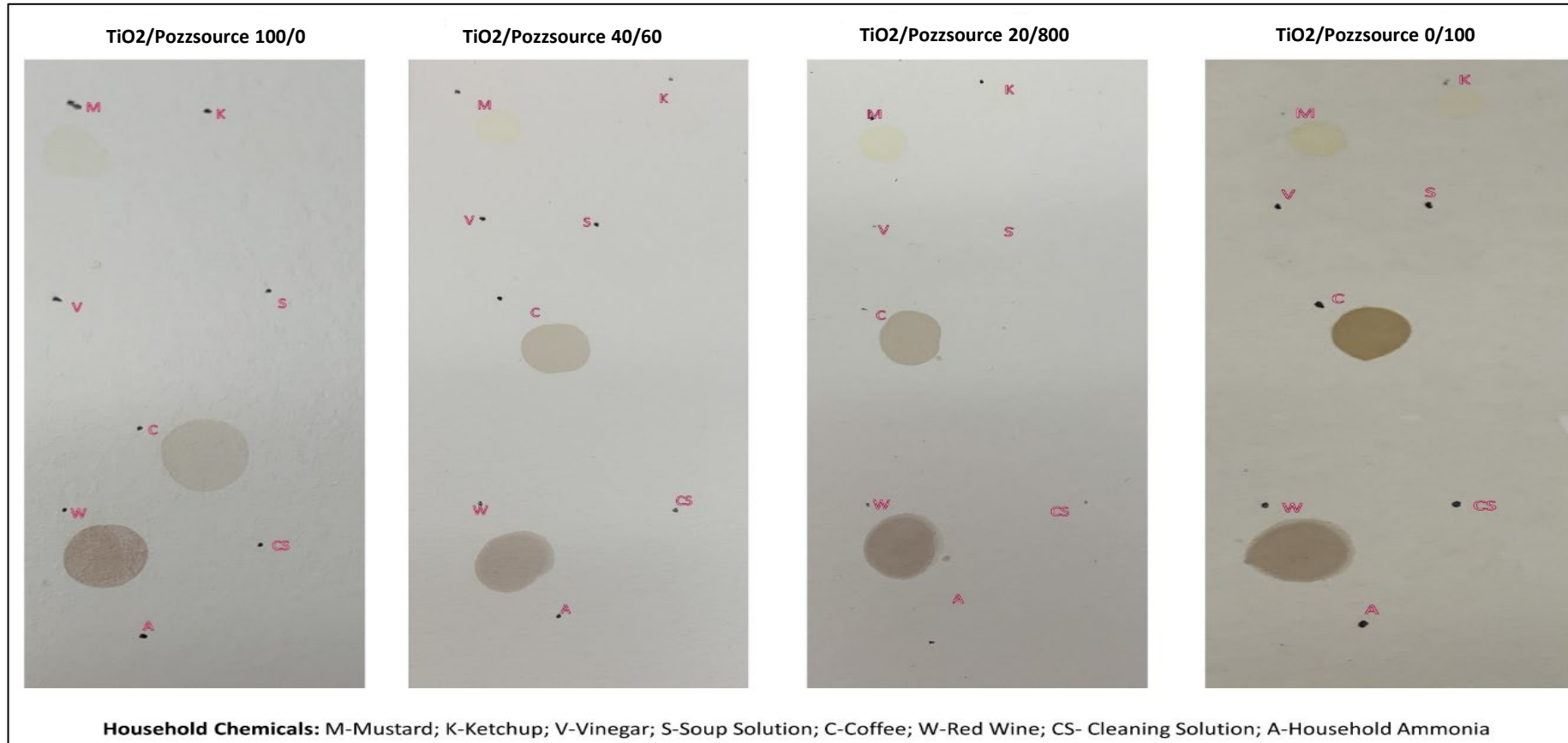
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Dry Film Properties

➤ Stain Resistance – Household Chemicals

- There's no adverse effect on resistance to household chemicals or spot test that is visible for PFE vs that of TiO₂.

20 Hours



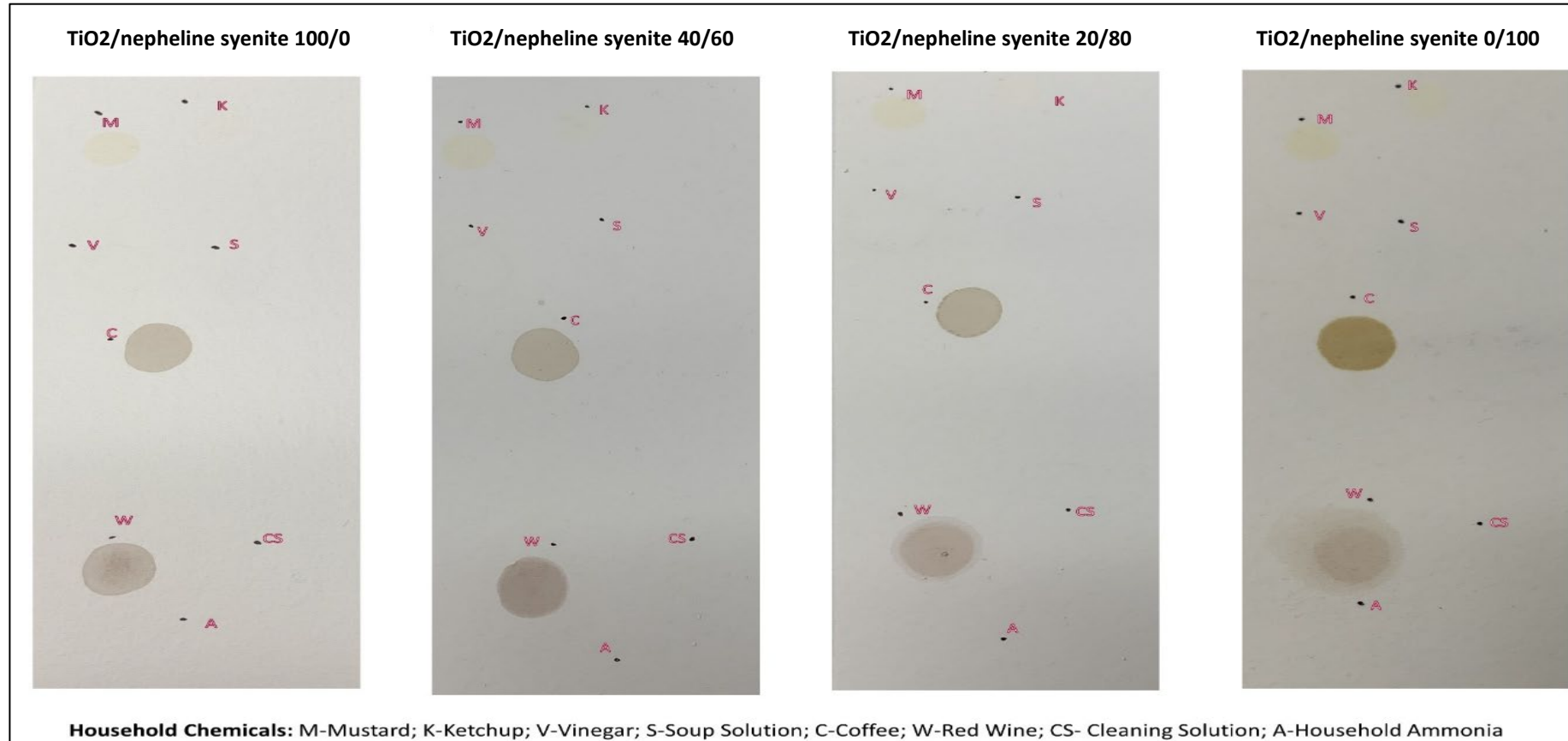
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Dry Film Properties

➤ Stain Resistance – Household Chemicals

- There's no adverse effect on resistance to household chemicals or spot test that is visible for PFE vs that of nepheline syenite formulation. **20 Hours**

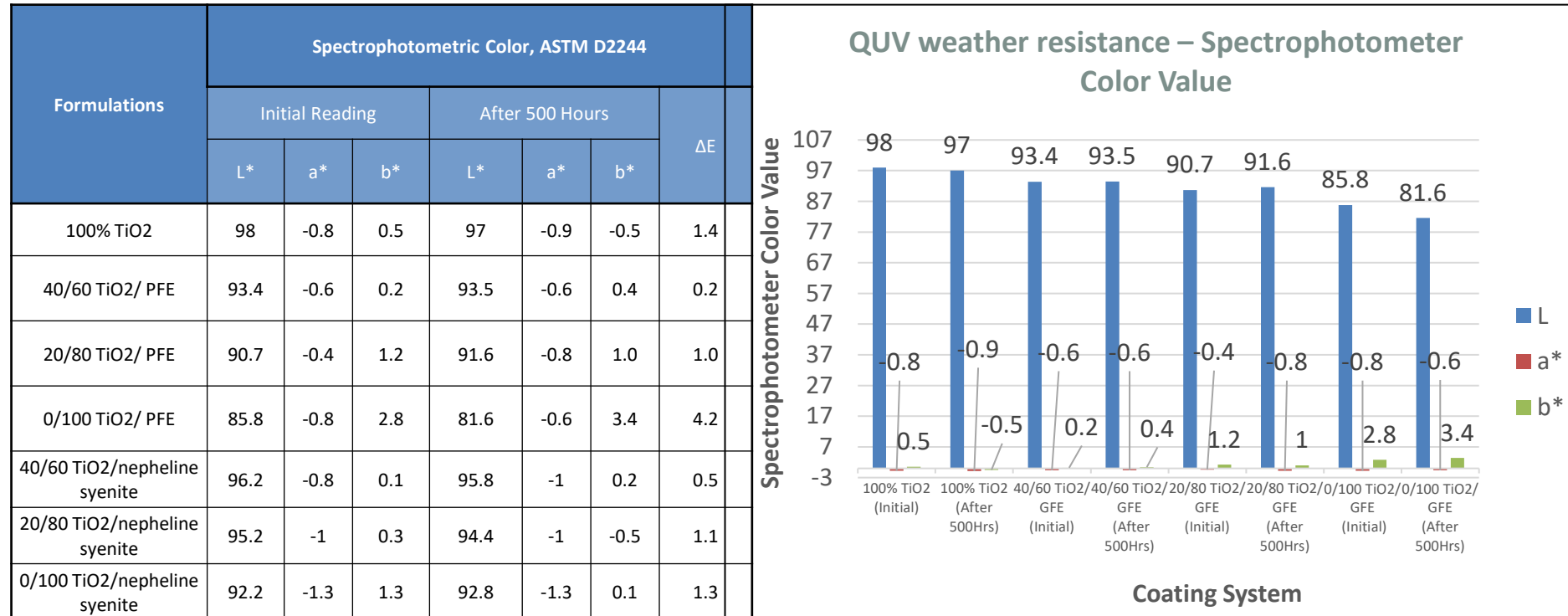


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Dry Film Properties

- QUV Accelerated Weather Resistance – Spectrophotometric Color
 - No adverse effect on the color, gloss or weather resistance for PFE vs that of TiO₂ or nepheline syenite formulation
 - The test was done in accordance with ASTM D4329 for 500 hours



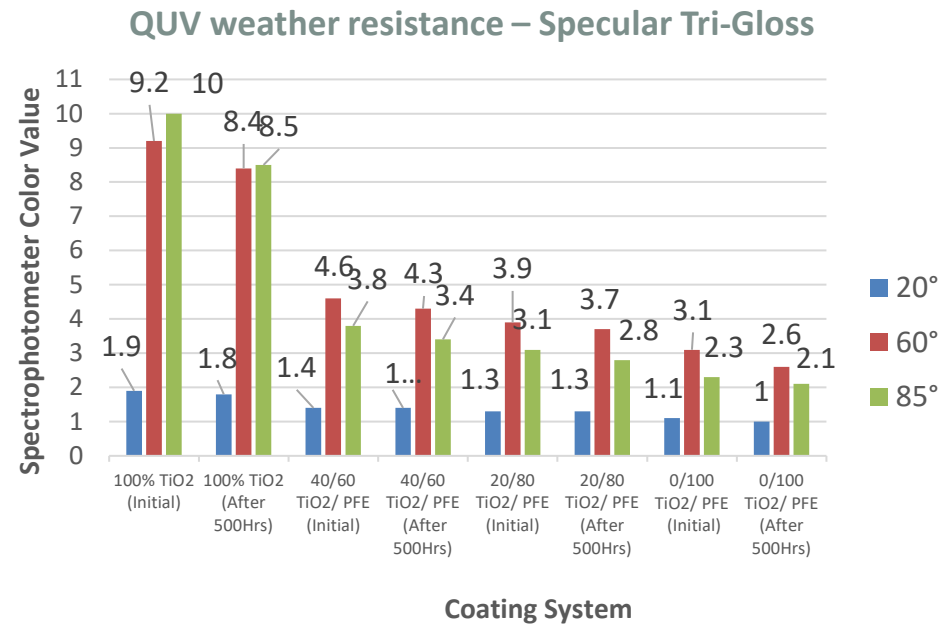
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Dry Film Properties

- QUV Accelerated Weather Resistance – Specular Tri Gloss
 - No significant loss in gloss after 500 Hours of QUV–A Exposure.
 - The test was done in accordance with ASTM D4329 for 500 hour.

Formulations	Gloss readings					
	Initial Reading			After 500 Hours		
	20°	60°	85°	20°	60°	85°
100% TiO2	1.9	9.2	10	1.8	8.4	8.5
40/60 TiO2/ PFE	1.4	4.6	3.8	1.4	4.3	3.4
20/80 TiO2/ PFE	1.3	3.9	3.1	1.3	3.7	2.8
0/100 TiO2/ PFE	1.1	3.1	2.3	1	2.6	2.1
40/60 TiO2/nepheline syenite	1.5	4.8	4.1	1.4	4.2	3.6
20/80 TiO2/nepheline syenite	1.4	4	3.2	1.3	3.6	2.7
0/100 TiO2/nepheline syenite	1.3	3.2	2.5	1.3	2.8	2.2



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Contact Information

- For more information about how Pozzsource Functional Extenders can help improve the performance of coatings formulations, contact your Pozzsource representative
 - Jim Bowen - Director of Business Development/Founder
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