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VANDERBILT *Report*

VANTALC® 3500 and VANSIL® W 30
for
TiO₂ Spacing in an Interior Latex Flat Paint

No. 3788-14
by J. W. Anderson

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PAINT LAB REPORT No. 3788-14

TITLE: VANTALC[®] 3500 and VANSIL[®] W 30 for TiO₂ Spacing in an Interior Latex Flat Paint

INTRODUCTION: Various levels of VANTALC 3500, VANSIL W 30 or blends of the two minerals were tested as TiO₂ spacers in an interior latex flat paint formula. 50/50 blends were found to maximize the positive aspects of each mineral and minimize the negative ones.

DISCUSSION and RESULTS: Every inert filler brings a unique set of properties to the coatings to which it is added. Talc is known to be an effective TiO₂ spacer in latex paints, but because of its softness, talc-filled paint can have low scrub resistance. Wollastonite, being significantly harder than talc, contributes to improved scrub resistance, but optical properties may suffer. The NYTAL[®] products have been found over the years to offer the best of both worlds because of their unique multi-morphous mix of hard and soft minerals. With regard to the replacement of NYTAL products, R.T. Vanderbilt Company has recommended the blending of talc and wollastonite to somewhat replicate this multi-morphous mineral mix. In the current study, a series of interior latex flat paints was prepared with various amounts of VANTALC 3500 or VANSIL W 30, or 50/50 blends of each. For each paint type, three levels of TiO₂ and inert filler were employed. The trials were as follows:

Formula Number	TRIAL Number	Gallons TiO ₂	Gallons VANTALC 3500	Gallons VANSIL W 30
112908 A	I	3.8	7.8	0.0
112908 B	II	3.0	8.6	0.0
112908 C	III	2.3	9.2	0.0
112908 D	IV	3.8	0.0	7.8
112908 E	V	3.0	0.0	8.6
112908 F	VI	2.3	0.0	9.2
112908 G	VII	3.8	3.9	3.9
112908 H	VIII	3.0	4.3	4.3
112908 I	IX	2.3	4.6	4.6

See Table 1 for the formulas as run.

The paints were tested for viscosity, Hegman fineness, dry brightness, L a b color, gloss, opacity, scrub resistance and ASTM Hiding Power. The results are given in Tables 2 and 3 and the accompanying graphs. As anticipated, blending the two minerals took advantage of the strong points of each mineral and minimized the weaknesses. The following observations were made:

- 1) Hegman fineness: All paints were at 5.
- 2) Viscosity: Paints made with **VANTALC 3500** had lower viscosity than those made with **VANSIL W 30**. The viscosity of the paints made with blends of both minerals was higher than that of the paints made with each mineral alone. This could be a result of the finer talc particles packing between the larger wollastonite particles.
- 3) Dry Brightness: The brightness of the paints was not affected by the specific TiO₂ spacer. The quantity of TiO₂ had more effect on the brightness than the particular inert filler. The paints made with blends had a slightly lower brightness than those made with each mineral alone.
- 4) Gloss: Paints made with **VANSIL W 30** had lower 85° sheen than those made with **VANTALC 3500**. The 85° sheen of paints made with blends was slightly higher than that of paints made with **VANSIL W 30**, but lower than that of paints made with **VANTALC 3500**.
- 5) Scrub Resistance: Paints made with **VANSIL W 30** had significantly better scrub resistance than those made with **VANTALC 3500**. The scrub resistance of paints made with blends was worse than that of paints made with **VANSIL W 30**, but better than that of paints made with **VANTALC 3500**.
- 6) ASTM Hiding Power: Paints made with **VANTALC 3500** had higher spreading rates than those made with **VANSIL W 30**. The Hiding Power of paints made with blends was worse than that of paints made with **VANTALC 3500**, but better than that of paints made with **VANSIL W 30**.

These results show that blends of the fillers **VANTALC 3500** and **VANSIL W 30** in an interior latex flat paint can yield the good TiO₂ spacing and hiding power of **VANTALC 3500** and the good low angle sheen and scrub resistance of **VANSIL W 30**.

EXPERIMENTAL: The interior latex flat paints were prepared according to the formulas given in Table 1. The paints were tested for Hegman fineness, Stormer viscosity and Brookfield viscosity. Drawdowns were made onto plain white cards at 8 mil clearance and dried at ambient conditions. G. E. Brightness, L a b color and gloss were measured. Drawdowns were made at 4 mil, 6 mil and 8 mil clearance onto black and white opacity cards and air dried at ambient conditions. Opacity was measured as the ratio of the brightness over the black area to the brightness over the white area. Scrub Resistance was measured according to ASTM D 2486-06 on 8 mil clearance drawdowns. Hiding Power was measured according to ASTM D 2805-96a.

CONCLUSION: This study shows that blends of **VANTALC 3500** and **VANSIL W 30** can give improved performance to an interior latex flat paint, as compared to either mineral alone.

Table 1
Formula 112908
50 PVC Interior Latex Flat Paint
TiO₂ Spacing Study

	112908 A TRIAL I		112908 B TRIAL II		112908 C TRIAL III		112908 D TRIAL IV		112908 E TRIAL V		112908 F TRIAL VI	
	pounds	gallons	pounds	gallons	pounds	gallons	pounds	gallons	pounds	gallons	pounds	gallons
DISPERSION												
2% Cellosize [®] QP 4400 ¹	202.0	24.1	202.0	24.1	202.0	24.1	202.0	24.1	202.0	24.1	202.0	24.1
Drewplus [®] L 475 ²	2.0	0.3	2.0	0.3	2.0	0.3	2.0	0.3	2.0	0.3	2.0	0.3
DARVAN [®] 7N ³	10.0	1.0	10.0	1.0	10.0	1.0	10.0	1.0	10.0	1.0	10.0	1.0
Triton [®] CF 10 ¹	2.0	0.2	2.0	0.2	2.0	0.2	2.0	0.2	2.0	0.2	2.0	0.2
Ti-Pure [®] R 706 ⁴	125.0	3.8	100.0	3.0	75.0	2.3	125.0	3.8	100.0	3.0	75.0	2.3
Satintone [®] W ⁵	150.0	6.9	150.0	6.9	150.0	6.9	150.0	6.9	150.0	6.9	150.0	6.9
VANTALC [®] 3500 ³	185.0	7.8	205.0	8.6	220.0	9.2	0.0	0.0	0.0	0.0	0.0	0.0
VANSIL [®] W 30 ³	0.0	0.0	0.0	0.0	0.0	0.0	185.0	7.8	205.0	8.6	220.0	9.2
<i>Disperse at high speed for 15 minutes. Reduce speed for let down.</i>												
LET DOWN												
Water	80.0	9.6	80.0	9.6	80.0	9.6	80.0	9.6	80.0	9.6	80.0	9.6
Drewplus L 475	2.0	0.2	2.0	0.2	2.0	0.2	2.0	0.2	2.0	0.2	2.0	0.2
UCAR [®] 300 Latex ¹	315.0	35.5	315.0	35.5	315.0	35.5	315.0	35.5	315.0	35.5	315.0	35.5
<i>Preblend next two items and add:</i>												
Water	80.0	9.6	80.0	9.6	80.0	9.6	80.0	9.6	80.0	9.6	80.0	9.6
Optiflo [®] H 370 ⁶	15.0	1.0	15.0	1.0	15.0	1.0	15.0	1.0	15.0	1.0	15.0	1.0
<i>Mix at slow speed for 10 minutes.</i>												
Totals	1168.0	100.0	1163.0	100.0	1153.0	99.9	1168.0	100.0	1163.0	100.0	1153.0	99.9
PAINT PROPERTIES												
Weight per gallon		11.7		11.6		11.5		11.7		11.6		11.5
% Solids	by weight	54.6		54.4		54.0		54.6		54.4		54.0
	by volume	37.2		37.2		37.2		37.2		37.2		37.2
PVC		50		50		50		50		50		50
Pigment to binder ratio		2.66:1		2.63:1		2.57:1		2.66:1		2.63:1		2.57:1
Calculated VOC	lbs/gal	0		0		0		0		0		0
	g/L	0		0		0		0		0		0

Table 1 (con't)
Formula 112908
50 PVC Interior Latex Flat Paint
TiO₂ Spacing Study

	112908 G TRIAL VII		112908 H TRIAL VIII		112908 I TRIAL IX	
	pounds	gallons	pounds	gallons	pounds	gallons
DISPERSION						
2% Cellosize [®] QP 4400	202.0	24.1	202.0	24.1	202.0	24.1
Drewplus [®] L 475	2.0	0.3	2.0	0.3	2.0	0.3
DARVAN [®] 7N	10.0	1.0	10.0	1.0	10.0	1.0
Triton [®] CF 10	2.0	0.2	2.0	0.2	2.0	0.2
Ti-Pure [®] R 706	125.0	3.8	100.0	3.0	75.0	2.3
Satintone [®] W	150.0	6.9	150.0	6.9	150.0	6.9
VANTALC [®] 3500	91.0	3.9	100.0	4.3	108.0	4.6
VANSIL [®] W 30	94.0	3.9	104.0	4.3	113.0	4.6
<i>Disperse at high speed for 15 minutes. Reduce speed for let down..</i>						
LET DOWN						
Water	80.0	9.6	80.0	9.6	80.0	9.6
Drewplus L 475	2.0	0.2	2.0	0.2	2.0	0.2
UCAR [®] 300 Latex	315.0	35.5	315.0	35.5	315.0	35.5
<i>Preblend next two items and add:</i>						
Water	80.0	9.6	80.0	9.6	80.0	9.6
Optiflo [®] H 370	15.0	1.0	15.0	1.0	15.0	1.0
<i>Mix at slow speed for 10 minutes.</i>						
Totals	1168.0	100.0	1162.0	100.0	1154.0	99.9
PAINT PROPERTIES						
Weight per gallon		11.7	11.6		11.5	
% Solids	by weight	54.2	54.0		53.6	
	by volume	37.2	37.2		37.2	
PVC		50	50		50	
Pigment to binder ratio		2.66:1	2.62:1		2.58:1	
Calculated VOC	lbs/gal	0	0		0	
	g/L	0	0		0	

Raw Material Suppliers

- ¹ Dow Chemical Company, Midland, MI
- ² Ashland Chemical Company, Covington, KY
- ³ R.T. Vanderbilt Company, Inc., Norwalk, CT
- ⁴ E.I. du Pont de Nemours & Company, Wilmington, DE
- ⁵ Engelhard Minerals, Iselin, NJ
- ⁶ United Catalysts, Inc. Louisville, KY

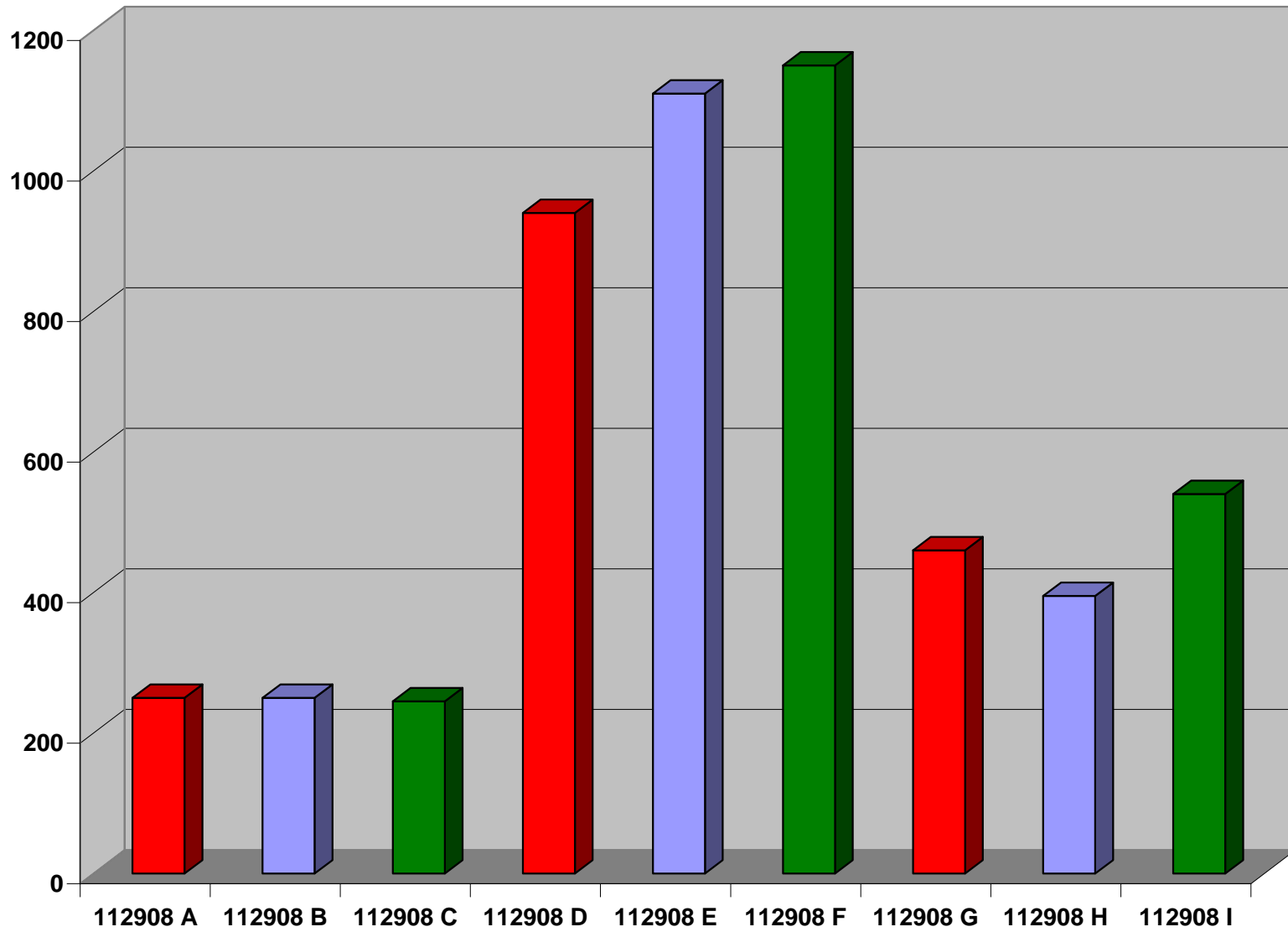
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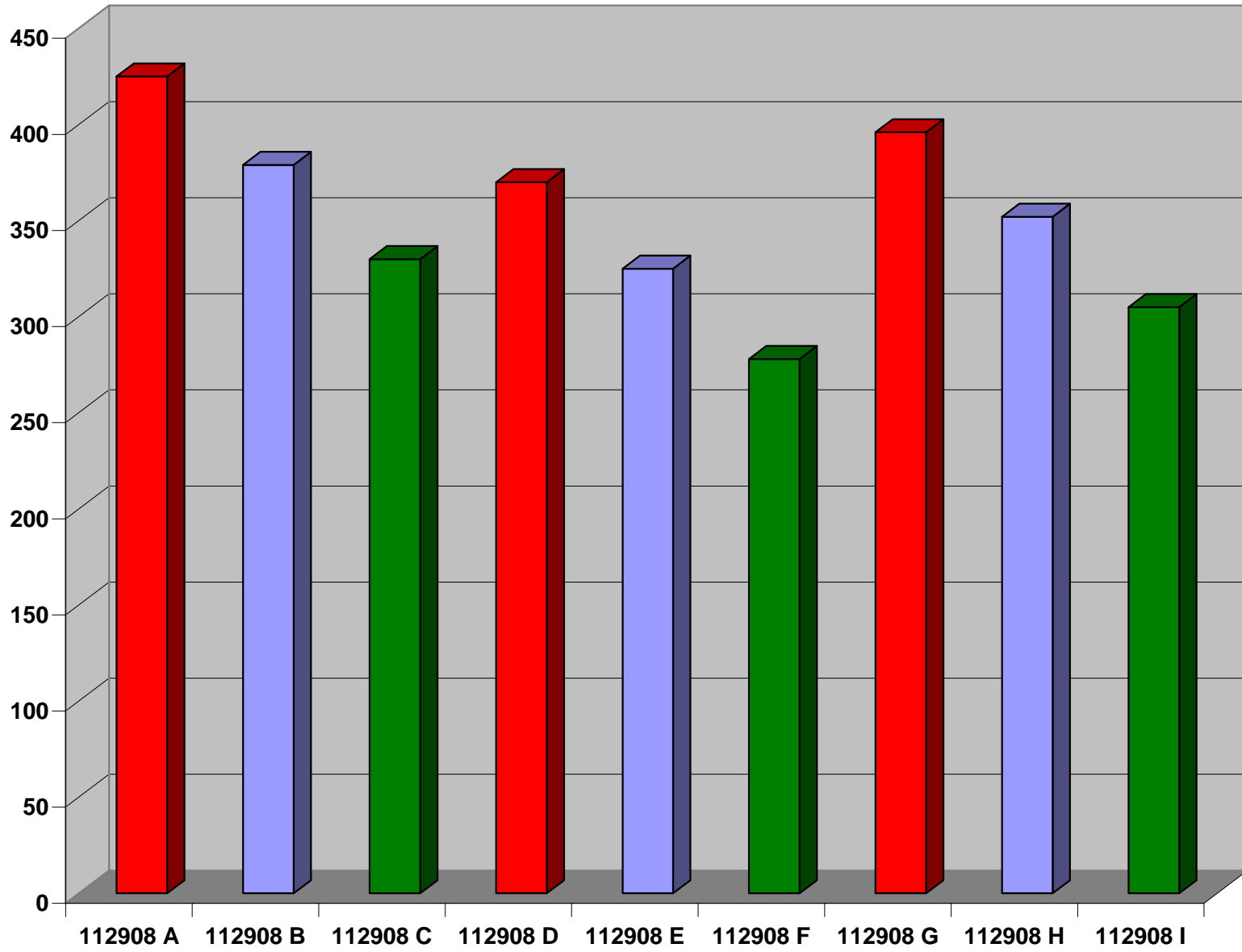
Table 2
Formula 112908
50 PVC Interior Latex Flat Paint
TiO₂ Spacing Study

		112908 A	112908 B	112908 C	112908 D	112908 E	112908 F	112908 G	112908 H	112908 I
		TRIAL I	TRIAL II	TRIAL III	TRIAL IV	TRIAL V	TRIAL VI	TRIAL VII	TRIAL VIII	TRIAL IX
Gallons TiO₂		3.8	3.0	2.3	3.8	3.0	2.3	3.8	3.0	2.3
Gallons VANTALC[®] 3500		7.8	8.6	9.3	0.0	0.0	0.0	3.9	4.3	4.6
Gallons VANSIL[®] W 30		0.0	0.0	0.0	7.8	8.6	9.3	3.9	4.3	4.6
Hegman fineness		5	5	5	5	5	5	5	5	5
KU		99	98	102	106	104	105	108	105	106
Brookfield viscosity										
	10 rpm	8100	7300	8400	10800	10400	10500	12800	111000	12000
	20 rpm	5100	4900	5700	7000	6700	6900	7900	7100	7500
	50 rpm	3100	2900	3500	4000	3900	4000	4500	4100	4300
	100 rpm	2100	2100	2400	2700	2600	2700	3000	2700	2900
G. E. Brightness		89.6	88.7	87.6	89.4	88.5	87.3	88.6	88.6	87.2
L		95.2	94.8	94.3	95.4	95.0	94.5	94.9	94.9	94.3
a		-0.3	-0.4	-0.4	-0.5	-0.5	-0.5	-0.3	-0.3	-0.3
b		1.1	1.2	1.4	1.6	1.8	1.9	1.5	1.5	1.6
ΔE			0.42	0.95		0.45	0.95		0.00	0.61
Gloss										
	20 °	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
	60 °	2.6	2.5	2.5	2.3	2.3	2.3	2.4	2.4	2.4
	85 °	6.1	5.5	4.6	2.8	2.5	2.0	3.7	3.3	3.1
Opacity										
	4 mil cl	0.958	0.948	0.947	0.961	0.940	0.926	0.953	0.950	0.919
	6 mil cl	0.984	0.981	0.978	0.983	0.974	0.965	0.983	0.972	0.964
	8 mil cl	0.995	0.993	0.990	0.994	0.988	0.984	0.993	0.992	0.987
Scrub Cycles to failure [See Graph 1]	8 mil cl	250	250	245	940	1110	1150	460	395	540

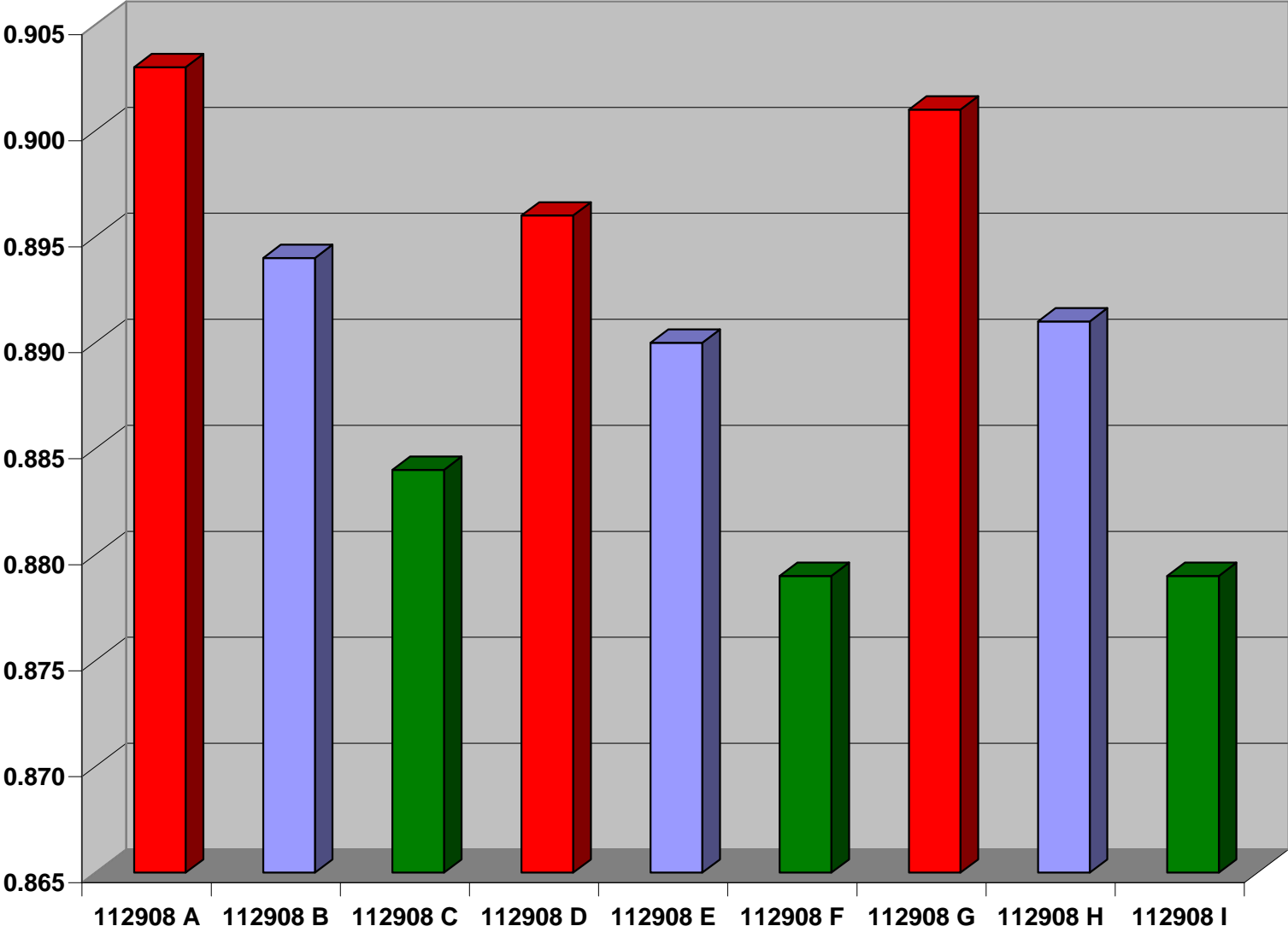
Graph 1
Scrub Resistance



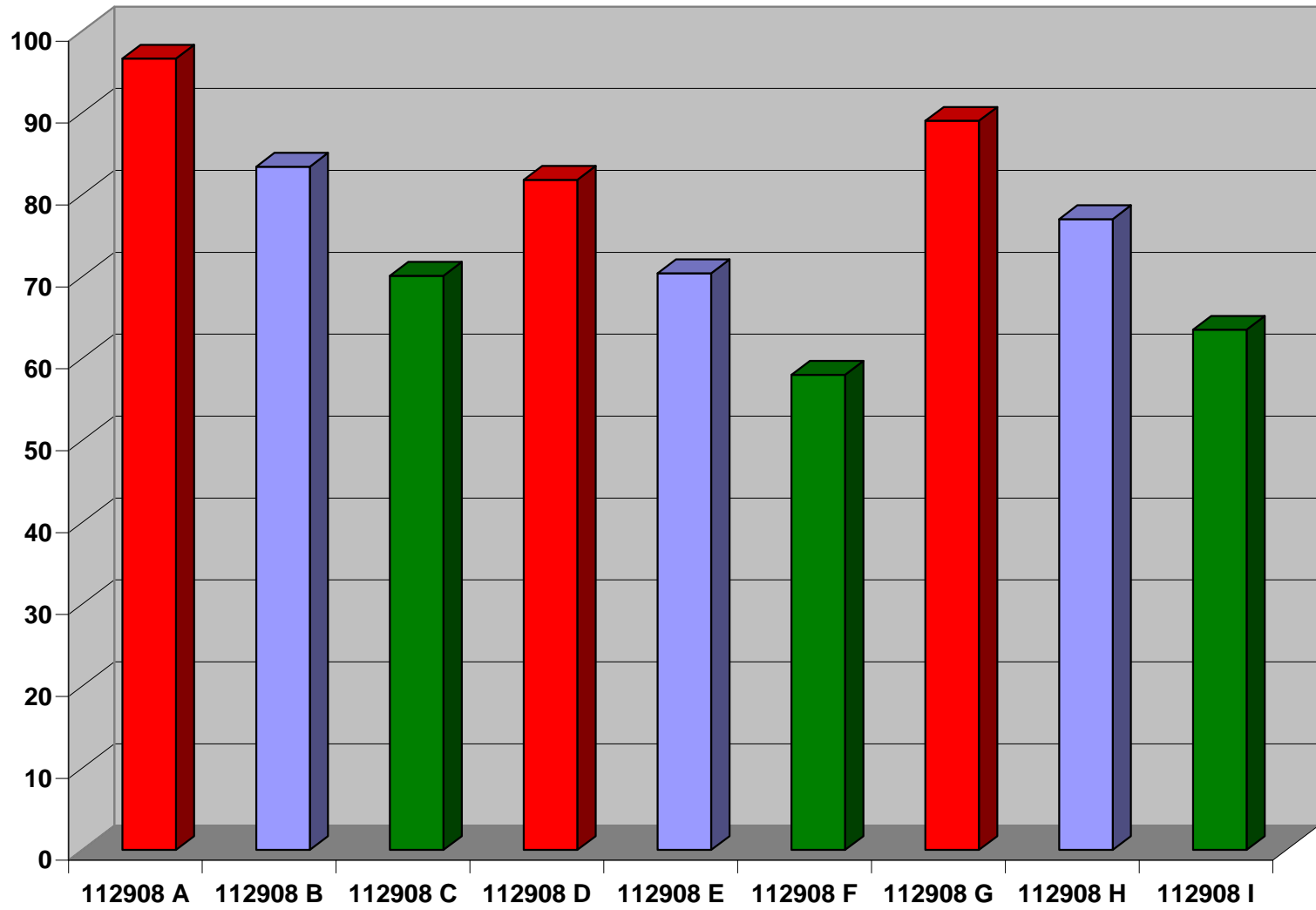
Graph 2
Hiding Power (ft²/gal)



Graph 3
Reflectivity



Graph 4
Scattering Coefficient



Graph 5
Contrast Ratio

