



Vanderbilt Minerals, LLC

A Wholly Owned Subsidiary of R.T. Vanderbilt Holding Company, Inc.

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**FORMULARY
DENTIFRICE
No. 914rev**



Dentifrice Products Formulary

VANATURAL® Bentonite Clay **VEEGUM**® Magnesium Aluminum Silicate **VANZAN**® Xanthan Gum

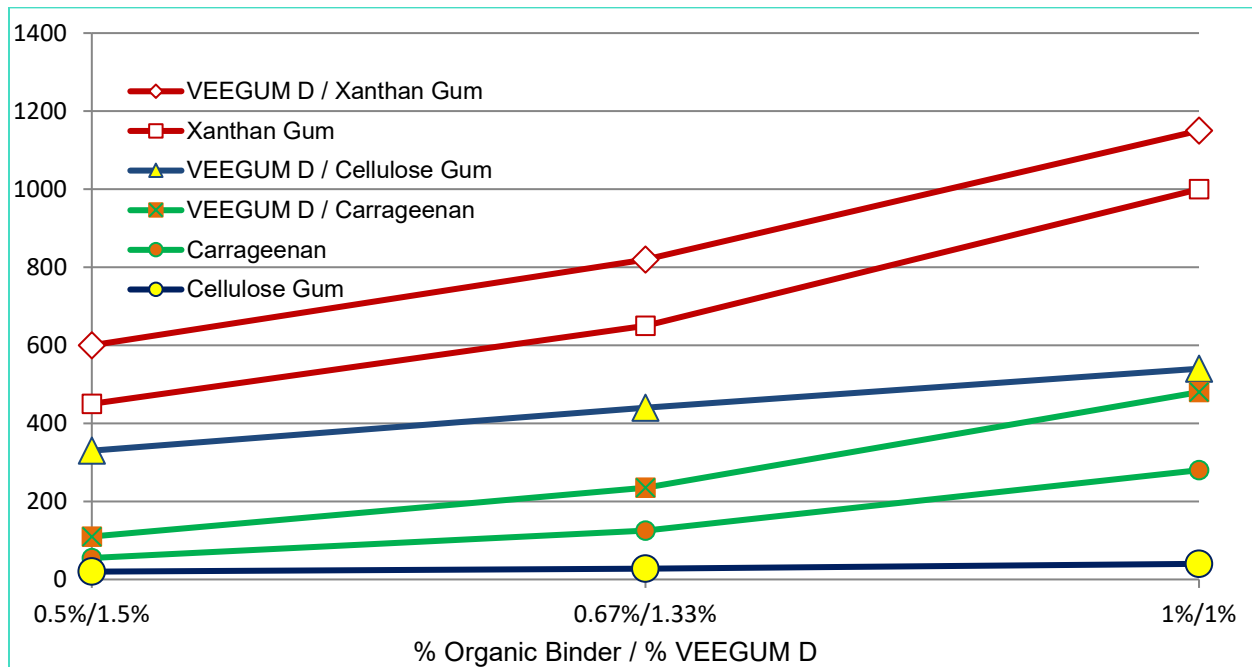
The binder in a dentifrice plays a significant role in the consumer's perception of dentifrice quality, ease of use, sensory appeal, and efficacy. If the product appears wet, runny, stringy or discolored, if it tastes bland, feels gritty or is gummy in use, the consumer will be less likely to buy it again, regardless of its effectiveness as a tooth cleaner.

VEEGUM® Magnesium Aluminum Silicate and **VANATURAL**® Bentonite Clay are natural water-washed smectite clays that provide the essential binder properties.

Smectite Clay Binders	
VEEGUM D	Original fast hydrating clay binder for low-water dentifrices.
VANATURAL	Fast hydrating ECOCERT/COSMOS grade bentonite clay.
VANATURAL MC	Fast hydrating bacteria-controlled bentonite clay.
Typical use level is 0.5% - 2.0%	
Several additional grades are available to match formulation requirements.	

Binder Requirements	VEEGUM/VANATURAL Clays
Must provide a uniform composition, stabilized against the separation of liquid and solid phases, even in temperature extremes.	The clay colloidal structure ensures the uniform and stable dispersion of abrasive while protecting against syneresis; this structure is insensitive to temperature extremes.
Must provide a "short" rather than stringy ribbon on application to the toothbrush	The colloidal structure does not allow for stringiness and will inhibit the stringy nature of gum and polymer binders.
Must keep the paste thick enough to sit on the toothbrush bristles without sinking through them.	The pseudoplasticity and yield value imparted by the clay promotes smooth extrusion but sufficient structure to inhibit flow of the dentifrice into the brush bristles.
Must maintain the product's paste or gel consistency, while allowing it to be shear-thinning and to foam readily.	The clay-based binder system provides viscosity control in the container and a shear-thinning non-gummy texture in use so that foaming is optimized.
Should not detract from product color, flavor release or rinseability	The clay does not add flavor nor does it interfere with flavor release. It's inhibition of gumminess ensures easy rinsing.
Must be compatible with fluorides and other therapeutic ingredients	The clay is generally compatible with most therapeutics. With NaF, adding water-soluble phosphate (e.g., TSPP) will prevent the precipitation of CaF ₂ .

Because the colloidal structure of these clays resists temperature extremes, prevents gumminess or tackiness, and promotes shortness on dentifrice extrusion, they are typically used in combination with organic binders in order to counter the stringy, gummy, tacky and the temperature sensitivity of these gums. The clay and gum also provide synergistic rheological properties as shown the following table.



Sodium Fluoride and Smectite Clays

The extent to which smectite clay may affect fluoride availability in sodium fluoride dentifrices is determined primarily by the amount of calcium, as residual calcium carbonate, introduced incidentally with the clay. When sodium fluoride is used as the therapeutic ingredient, calcium adversely affects fluoride bioavailability due to the precipitation of calcium fluoride (CaF₂). Residual calcium carbonate is minimized or absent in **VEEGUM D**, **VANATURAL** and **VANATURAL MC**. Availability of fluoride from NaF is further optimized by the use of water-soluble phosphate compounds, such as tetrapotassium pyrophosphate (TKPP) and tetrasodium pyrophosphate (TSPP), which are otherwise commonly employed in dentifrice products as anticalculus agents. When added to the smectite clay dispersion before the introduction of sodium fluoride, these phosphates are believed to sequester any available Ca²⁺, thus preventing the precipitation of CaF₂.

Instant Toothpaste

VEEGUM D, **VANATURAL** and **VANATURAL MC** clays are suited as essential minerals in tooth powders. The clay facilitates the adhesion of the powder to wet toothbrush bristles, promotes uniform dispersion of the abrasive during brushing, helps segregate food particles removed from tooth surfaces and does not interfere with rinsing.

FORMULARY

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Fluoride-Stable Toothpaste No. 613

	Wt. %
A VEEGUM® D Magnesium Aluminum Silicate	1.50
Water	41.11
B Tetrasodium Pyrophosphate	1.00
C Titanium Dioxide	0.30
D VANZAN® NF Xanthan Gum	0.80
Cellulose Gum (Aqualon® CMC 7HF ¹)	0.30
Methyl Paraben	0.20
Propyl Paraben	0.05
E Sorbitol, 70%	10.00
Glycerin	10.00
Hydrated Silica (Zeodent® 113 ²)	30.00
Saccharin	0.20
F Water	2.80
Sodium Fluoride	0.24
Sodium Lauryl Sulfate, 29%	1.50

Procedure: Slowly add the **VEEGUM® D** to the water agitated at maximum available shear. Mix until fully hydrated. Add Part B, Part C, Part D, Part E and Part F in order, mixing after each until uniform.

RAW MATERIAL SUPPLIERS
¹Ashland, Inc., Covington, KY

²J.M. Huber Corporation, Havre de Grace, MD

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VEEGUM and **VANZAN** are registered trademarks of Vanderbilt Minerals, LLC.

Aqualon is a registered trademark of Hercules, Inc.

Zeodent is a registered trademark of J.M. Huber Corporation

Rev07/01/2013

Sodium Monofluorophosphate Toothpaste No. 405 and No. 406

		No. 405	No. 406
		Wt. %	Wt. %
A	VEEGUM® D Magnesium Aluminum Silicate	1.20	1.20
	Water	18.94	18.94
B	Sorbitol, 70%	12.50	12.50
C	Glycerin	12.50	12.50
	VANZAN® NF Xanthan Gum	0.70	---
	Cellulose Gum (Aqualon® CMC 7MF ¹)	---	0.70
D	Calcium Pyrophosphate	50.0	50.00
E	Trisodiumphosphate Dodecahydrate	0.50	0.50
F	Sodium Monofluorophosphate	0.76	0.76
G	Flavor	1.00	1.00
	Saccharin	0.20	0.20
	Sodium Benzoate	0.20	0.20
	Sodium Lauryl Sulfate	1.50	1.50

Procedure: Slowly add the **VEEGUM® D** to the water agitated at maximum available shear. Mix until fully hydrated. Add Part B, Part C, Part D, Part E, Part F and Part G in order, mixing after each until uniform.

RAW MATERIAL SUPPLIERS
¹Ashland, Inc., Covington, KY

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Rev07/01/2013

Toothpaste No. 403 and No. 404

	No. 403	No. 404
	Wt. %	Wt. %
A VEEGUM® D Magnesium Aluminum Silicate Water	1.30	1.30
	10.10	10.10
B Sorbitol, 70%	25.00	25.00
C Glycerin VANZAN® NF Xanthan Gum Cellulose Gum (Aqualon® CMC 7MF ¹)	10.00	10.00
	0.70	---
	---	0.70
D Dicalciumphosphate Dihydrate	50.00	50.00
E Flavor Saccharin Sodium Benzoate Sodium Lauryl Sulfate	1.00	1.00
	0.20	0.20
	0.20	0.20
	1.50	1.50

Procedure: Slowly add the VEEGUM® D to the water agitated at maximum available shear. Mix until fully hydrated. Add Part B, Part C, Part D and Part E in order, mixing after each until uniform.

RAW MATERIAL SUPPLIERS

¹Ashland, Inc., Covington, KY

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Rev07/01/2013

Liquid Tooth Polish No. 413

		Wt. %
A	VEEGUM® D Magnesium Aluminum Silicate	1.25
	Water	25.15
B	Sorbitol, 70%	12.50
C	Glycerin	12.50
	VANZAN® NF Xanthan Gum	0.70
D	Dicalciumphosphate Dihydrate	45.00
E	Flavor	1.00
	Saccharin	0.20
	Sodium Benzoate	0.20
	Sodium Lauryl Sulfate	1.50

Procedure: Slowly add the **VEEGUM® D** to the water agitated at maximum available shear. Mix until fully hydrated. Add Part B, Part C, Part D and Part E in order, mixing after each until uniform.

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Rev07/01/2013

Natural Soft-Gel Toothpaste No. 634

	Wt.%
A	VANATURAL [®] Bentonite Clay 1.00
	Water 16.60
	D-Xylitol NF FCC 30-80 Mesh K ¹ 10.00
B	Natural Calcium Carbonate (OMYA-CAL [®] FG-4 AZ ²) 65.00
C	Glycerin (Supero [®] l KPO Glycerin, USP/FCC/EP ³) 5.00
	VANZAN [®] NF Xanthan Gum 0.50
D	Benzyl Alcohol NF Kosher (UNOL [™] BZAL ¹) 0.40
	Aqua (and) Sodium Lauroyl Sarcosinate (Crodasinic [™] LS 30 NT-LQ-(RB) ⁴) 1.50

Procedure: Slowly add the **VANATURAL**[®] while mixing at maximum available shear until fully hydrated. Then, add the xylitol and mix until fully dissolved. (Note: The batch will cool significantly after the xylitol addition.) Slowly add the calcium carbonate, Part B, and mix until thoroughly dispersed. In Part C, slurry the **VANZAN**[®] NF and glycerin, add in and mix until thoroughly dissolved and batch is smooth. Then, add the benzyl alcohol and mix in. Next, while using appropriate mixing in order to avoid air entrapment, slowly add the sodium lauroyl sarcosinate solution and mix in completely.

RAW MATERIAL SUPPLIERS
¹Universal Preserv-A-Chem, Somerset, NJ

²OMYA, Cincinnati, OH

³P&G Chemicals, Cincinnati, OH

⁴Croda, Inc., Edison, NJ

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Crodasinic is a trademark of Croda, Inc.

OMYA-CAL is a registered trademark of OMYA AG Corporation.

Superol is a registered trademark of The Procter & Gamble Company.

UNOL is a trademark of Universal Preserv-A-Chem, Inc.

Rev10/26/2016

Baking Soda Toothpaste with Fluoride No. 635

	Wt.%
A VEEGUM® D Magnesium Aluminum Silicate	1.00
Water	17.66
B Tetrasodium Pyrophosphate, Food Grade	1.00
C Glycerin, USP	10.00
VANZAN® NF Xanthan Gum	0.40
D Sodium Fluoride (Sodium Fluoride USP Powder ¹)	0.24
Water	2.80
E Baking Soda (Sodium Bicarbonate USP Grade #1 Powder ²)	65.00
Sodium Saccharin USP FCC PDR K (Unisweet™ SOSAC ¹)	0.20
Sodium Benzoate (Sodium Benzoate PDR NF FCC K ¹)	0.20
Sodium Lauryl Sulfate, 29% (Sulfochem® SLS Surfactant ³)	1.50

Procedure: Slowly add the **VEEGUM® D** to the water while mixing at maximum available shear until fully hydrated. Add the TSP and mix until dissolved. Slurry the **VANZAN® NF** and glycerin and add Part C to the batch, mixing thoroughly until dissolved and batch is smooth. Dissolve the sodium fluoride in water and add Part D to the batch and mix in thoroughly. Slowly sift in the baking soda and mix until completely dispersed. Add the sodium saccharin and then sodium benzoate and mix well after each. While using appropriate mixing in order to avoid air entrapment, slowly add the sodium lauryl sulfate solution and mix in completely.

RAW MATERIAL SUPPLIERS
¹Universal Preserv-A-Chem, Somerset, NJ

²Natural Soda, Rifle, CO

³Lubrizol Advanced Materials, Inc., Cleveland, OH

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Sulfochem is a registered trademark of Lubrizol Advanced Materials, Inc.

Unisweet is a trademark of Universal Preserv-A-Chem.

Rev11/17/2016

Remineralizing/Desensitizing Liquid Dentifrice No. 637

	Wt.%
A	VEEGUM® D Magnesium Aluminum Silicate 1.00
	Water 36.70
	Sorbitol, 70% (Sorbitol Solution, USP/FCC, 70% ¹) 25.00
B	Glycerin, USP 10.00
	VANZAN® NF Xanthan Gum 0.40
C	Calcium Hydroxyapatite (and) Calcium Carbonate (Omyadent® 100 – OG ²) 5.00
	Hydrated Silica (Sorbosil™ AC35 ³) 20.00
	Sodium Saccharin USP FCC PDR K (Unisweet™ SOSAC ⁴) 0.20
	Sodium Benzoate (Sodium Benzoate PDR NF FCC K ⁴) 0.20
	Sodium Lauryl Sulfate, 29% (Sulfochem® SLS Surfactant ⁵) 1.50

Procedure: Slowly add the **VEEGUM® D** to the water while mixing at maximum available shear until fully hydrated. Add the sorbitol solution and mix in completely. Slurry the **VANZAN® NF** and glycerin and add Part B to the batch, mixing thoroughly until dissolved and batch is smooth. Slowly sift in the Omyadent 100 – OG and then the Sorbosil AC35 mixing well after each until thoroughly dispersed. Add the sodium saccharin and then the sodium benzoate and mix well after each. While using appropriate mixing in order to avoid air entrapment, slowly add the sodium lauryl sulfate solution and mix in completely.

RAW MATERIAL SUPPLIERS
¹Archer Daniels Midland, Decatur, IL

²OMYA, Cincinnati, OH

³PQ Corporation, Malvern, PA

⁴Universal Preserv-A-Chem, Somerset, NJ

⁵Lubrizol Advanced Materials, Inc., Cleveland, OH

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Sorbosil is a trademark of PQ Corporation.

Sulfochem is a registered trademark of Lubrizol Advanced Materials, Inc.

Unisweet is a trademark of Universal Preserv-A-Chem.

Rev01/04/2017

Toothpaste No. 440

	Wt.%
A VEEGUM® D Magnesium Aluminum Silicate	1.00
Water	16.70
B Sorbitol, 70%	25.00
C Glycerin, USP	10.00
Sodium Carboxymethyl Cellulose (Aqualon® CMC 7MF ¹)	0.40
D Calcium Carbonate	44.00
Flavor	1.00
Sodium Saccharin	0.20
Sodium Benzoate	0.20
Sodium Lauryl Sulfate, 29%	1.50

Procedure: Slowly add the **VEEGUM® D** to the water while mixing at maximum available shear until fully hydrated. Add the sorbitol solution and mix until uniform. Slurry the CMC and glycerin and add Part C to the batch, mixing thoroughly until dissolved and batch is smooth. Slowly sift in the calcium carbonate and mix until thoroughly dispersed. Add the flavor, sodium saccharin and then the sodium benzoate and mix well after each. While using appropriate mixing in order to avoid air entrapment, slowly add the sodium lauryl sulfate solution and mix in completely.

RAW MATERIAL SUPPLIERS
¹Ashland, Inc., Covington, KY

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